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The Electric Vehicle Company.

BY HUGH DOLNAR.

The Electric Vehicle Company, capitalized at ten millions, and located in the large armory building, 1684 Broadway, has set before itself the task of placing mechanically propelled cabs and carriages on the streets of New York, to compete with the horse-drawn vehicles for public patronage and commercial success.

In many ways this is the most important effort to enlarge the field of mechanical substitutions for animal labor ever made. The success of the New York cabs would certainly be followed by the use of mechanically propelled trucks, thus abolishing the horse for city use, and insuring clean streets and noiseless traffic, and the extirpation of certain now prevalent disorders of the eye, the nasal passages and the throat, which are declared to be due wholly to the use of the horse in city streets.

We are so accustomed to the horse that we are incapable of conceiving the depths of our bondage to that noble brute. Few of us realize the facts that the horse dominates city life in all directions, destroys our pavements, keeps our streets filthy in spite of all that can be done to clean them, and that the horse and the horse alone is responsible for most of the noise of city traffic.

The horse must have a rough pavement, so that its feet will not slip. As the horse's soft hoof was intended by nature for use on turf only, we have shod his feet with steel, and provided his shoes with projections to enter the depressions of the pavement, and we cannot make the pavement smooth, because if we do the horse slips on it. Were the horse entirely displaced by mechanically propelled vehicles the pavements could well be made of cast iron, and could be perfectly smooth, and all vehicle wheels would be equipped with elastic tires, and with these conditions of absolutely clean, smooth streets, and soft tires, all noise would cease, pavements would become almost imperishable, and vehicles much more durable.

It is indeed difficult to imagine such conditions of urban existence, yet they are absolutely certain to follow the successful introduction of mechanically propelled vehicles.

Were it possible to begin at the bottom and build upward the problem would be solved at once, and it would undoubtedly be the greatest blessing that ever befell humanity, as it exists in cities, if all horses were to die to-day, exterminating the entire equine race. Then the mechanical vehicle would be forced into use, and we could begin at the bottom by the construction of smooth streets, and with smooth streets all of the now existing drawbacks and difficulties of mechanical traction would be done away with.

Of course most readers will cry "Absurd! The horse is indispensable!" But if there were no more horses the machinists would very soon find mechanical traction agents cheaper and better than the horse, and show themselves entire masters of the question of transportation, the same as they are now the decisive factor in the fate of nations.

FIG. 1.—MORRIS AND SALOM ELECTROBAT.

FIG. 2.—NEW YORK CAB WITH WOODEN WHEELS.

Mechanical superiority rules the world at this moment, and the mightiest general falls if he does not have the best machinists to support him.

Now, since the streets must be kept rough so that the horses may have a foothold, we are forced to pave with stone blocks, and to use steel-tired vehicle wheels, because nothing less durable than steel can withstand the shock of dropping from stone to stone, and we are, so far, in great difficulties with the wheels of mechanically propelled vehicles.

So far as driving the motocycle is concerned, there is no sort of trouble, if we had smooth streets. We can and do drive carriages more cheaply by electric motors and the storage battery, or by explosion motors using gasoline for fuel, than carriages can be drawn by horses. Many persons believe also that steam can be successfully and economically used for small street vehicles, but to the writer's mind the explosion engine, or internal combustion motor, seems best adapted to street use. The Electrical Vehicle Company, while adopting the storage battery and electric motor for the propelling agent of its present carriages, has by no means decided that electrical propulsion is the only or the best motive agent for street vehicles. The best motor is not, in the opinion of this company, to be decided upon by any scientific theory, but by the searching test of practical service only, and whatever finally proves best will be adopted. Electric driving offers the great advantages of cleanliness, silence, absence of heat, and ease of management by non-technical drivers. Electrical driving has the drawback of 1,000 or 1,200 pounds non-paying load of storage battery, reducing the paying load to a very small percentage of the total load. Electric cabs to carry two passengers and a driver cannot, from present indications, be equipped with much less than about 1,200 pounds of battery, nor can the total weight of the vehicle fall much below 3,000 pounds. Even at this weight horse traction is so expensive where used intermittingly, as in case of cab service, that electricity can easily compete in traction cost, but the trouble lies in the wheel load. The driving wheels of an electric cab of the latest construction are loaded to about a thousand pounds each, which is too much to be carried on a pneumatic tire over ordinary street pavements. On asphalt this per wheel load can be carried easily enough, but on bad Belgian blocks, which is the prevailing New York type of pavement, a thousand pounds load is destructive to pneumatic tires, and steel tires are too hard on the passenger and the cab both at the speeds demanded by cab service.

With these broad outlines of the general problem of mechanical vehicles for street use before him, the reader will be prepared to understand the work of the Electrical Vehicle Company now in progress, under the general management of Mr. Fred Vieweg, who has had a long street railway experience in New York, and the mechanical direction of Mr. G. Herbert Condict, who installed the Englewood storage battery driven line of street cars in Chicago, which is the largest application of the storage battery to street propulsion yet made, and is considered wholly successful, as it is giving prompt and satisfactory service at a cost not exceeding that of a similar trolley line, while the street is kept clear of electric wires, both overhead and underground.

Upon its incorporation, August 16, 1898, the Electrical Vehicle Company absorbed the Electric Carriage & Wagon Company, which grew out of the efforts of the Electric Storage Battery Company, sole manufacturers of the "chloride accumulator," having offices in the Drexel Building, Philadelphia, to introduce storage battery driven vehicles. Messrs. Morris and Salom, two engineers of the Storage Battery Company, began work on electric wagons in 1894, and in 1895 showed a vehicle which they styled an "electrobat" at the "Times-Herald" motocycle contest, which was awarded the grand gold medal of honor. This machine is illustrated and described on page 1010 of the "American Machinist" for 1895. Morris and Salom proceeded to construct a light delivery wagon, a brougham and a cab, all storage battery driven, and in the spring of 1897 fourteen of these Morris and Salom cabs were placed on hire in New York. The public took kindly to the mechanical cabs, and though their number was too small to permit them to pay dividends, their mechanical success and favorable reception by users led to the formation of the present company.

The first type of the Morris and Salom cab is shown in Fig. 1. It was a vehicle of elegant appearance, built in accordance with Salom's patent, using large driving wheels in front and small steering wheels in the rear; Salom believing it much better to pull the steering wheels than to push them. These cabs had suspension wheels and 3-inch pneumatic tires, used with 125 pounds air pressure.

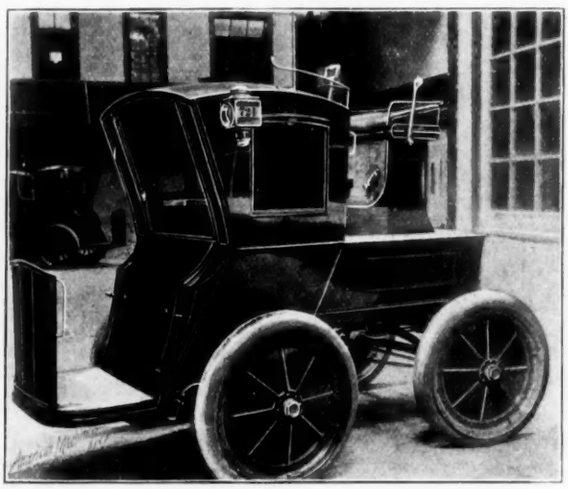


FIG. 3.—CAB WITH PLATE WHEELS.

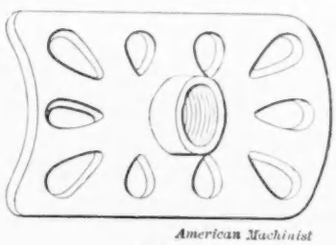


Fig. 5

BRONZE TIRE-NUT, VULCANIZED INTO TIRE.

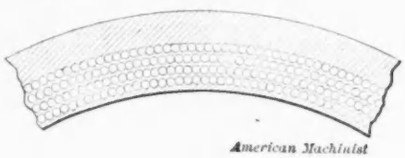


Fig. 4

SECTION OF TIRE, FULL SIZE—FOUR LAYERS OF SEA ISLAND DUCK.

It may be mentioned here that French motocycle builders, who are making most gratifying advances in mechanical locomotion, are finally, after thoroughly experimenting with steel tires, cushion tires and solid rubber tires, obtaining the most satisfactory results from pneumatic tires.

In the recent race, Paris to Amsterdam and return, 943 miles, all of the motocycles which covered the entire distance, except one, used pneumatic tires The leader made the 943 miles in 33 hours 4 minutes running time, at an average rate of 26.82 miles per hour. In some places a pace of 50 miles per hour is said to have been reached. Although the French are using the motocycle

mainly for sport, they are doing a most important work toward the introduction of the commercial motocycle, as they are finding out what constructions will stay together when urged to the utmost. Solid tires are easier driven than pneumatics under equal roads, but the pneumatics give easy riding, are the most durable and reduce general repairs on the vehicle. The higher the air pressure the less the liability to puncture, and also with constant diameters the less the liability to side slip. The lower the air pressure the softer and easier the action on the vehicle and rider, as users of the bicycle well know. But in the case of the motocycle many builders believe that at least 125 pounds air pressure is a necessity, as the high pressure not only lessens danger of puncture and side slip, but increases the traction.

The wheels proved the weak members of the first New York cabs. The spokes were made first three-sixteenths inch diameter, and somewhat larger afterward; they were abundantly strong for their legitimate work, but could not stand touching the curbstone or the wheels of other vehicles. A great many of them were wrecked and went into the scrap heap, and the tires wore out rapidly, and owing mainly, it is thought, to the wheel faults, this first type of cab demanded repairs to such an extent that they are now all out of commission and may never be used again, or if they are used it will be after remodeling on lines indicated by results obtained with the present vehicles.

For the sake of simplicity Morris and Salom use two motors, entirely independent of each other, each geared directly to a driving wheel, by means of steel pinions on the motor shafts meshing with bronze internal gears bolted to the wheel rims; reduction ratio 9 to 1. By using two independently driven wheels the compensating gear is avoided. This independent drive has been advocated by but few motocycle designers. Some of the steam advocates have placed the high and low pressure cylinders of a compound motor in individual connection with independent drivers. Generally the preference is for a single motor with the compensating gear.

After the experience gained by running the first cabs Morris and Salom designed the new ones, as shown in Figs. 2 and 3, with wooden and plate wheels. Believing that much of the trouble came from the 3-inch tires and 125 pounds air pressure, they decided to use 5-inch tires with 60 pounds pressure only, as 60 pounds is ample to float the wheel load with the increased tire diameter and gives a far more agreeable movement of the vehicle than the higher pressure. These 5-inch tires are, however, guaranteed by their makers up to 250 pounds per square inch. A full-sized section of this tire is given in Fig. 4, and Fig. 5 is a hand sketch of the flanged bronze nuts vulcanized into the tire, by means of which the tire is secured in the wheel flanges, twelve screws, $\frac{3}{8}$ inch diameter, being used for each tire, six on a side. These nuts have blind holes, tapped with a fine thread.

The motors are formed with capped eyes, which embrace the axle, the other side having an arm with an eye at its outer extremity, supported between two rubber springs, as clearly shown in the working construction drawing of the cab. The motors are about 2 horsepower each, and the empty cab, batteries on board, weighs about 3,200 pounds, of which about 2,000 pounds is carried on the drivers. The gage or track of the wheels is 58 inches, wheel base 55½ inches, and all four wheels are the same diameter—36 inches. Salom's original idea of making the driving wheels leaders and the steering wheels trailers is preserved in the new vehicles, although the general practice is to steer with the leading wheels. There seems to be no good ground for using the different sizes of wheels under the same cab, and it is, of course, conducive to economy to have but one size of wheel in use. Another important variation from the first cab construction is found in the ways which support the battery-tray. In the first lot of cabs the tray was carried on rubber rollers on iron rods. In the new cabs the battery-tray slides into L iron ways, which are set wider apart at the back end, where the trays go in and come out, than in front. This gives a firm and substantial support for the batteries, both up and down and sideways.

It will be noticed that no indications of the wheel details are given in the construction drawings, but the built-up plate wheel, constructed as clearly shown in the engravings, was selected for trial under the first hundred vehicles, fifty cabs and fifty broughams, which the company ordered from the Westinghouse Company.

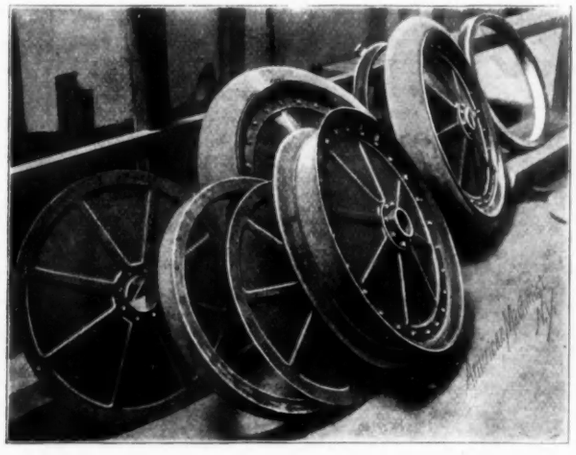


FIG. 6.—SHOWING CONSTRUCTION OF THE PLATE WHEEL.

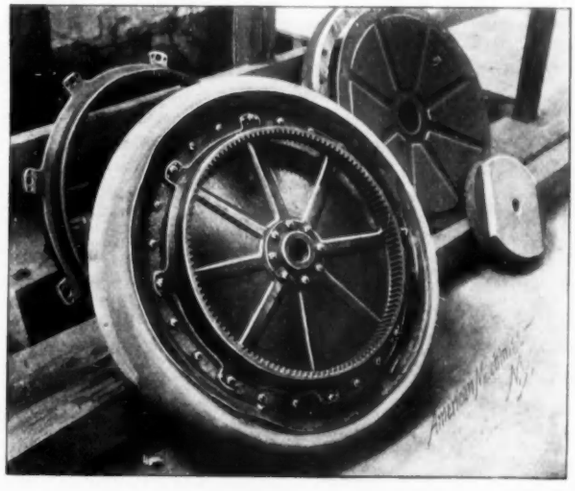
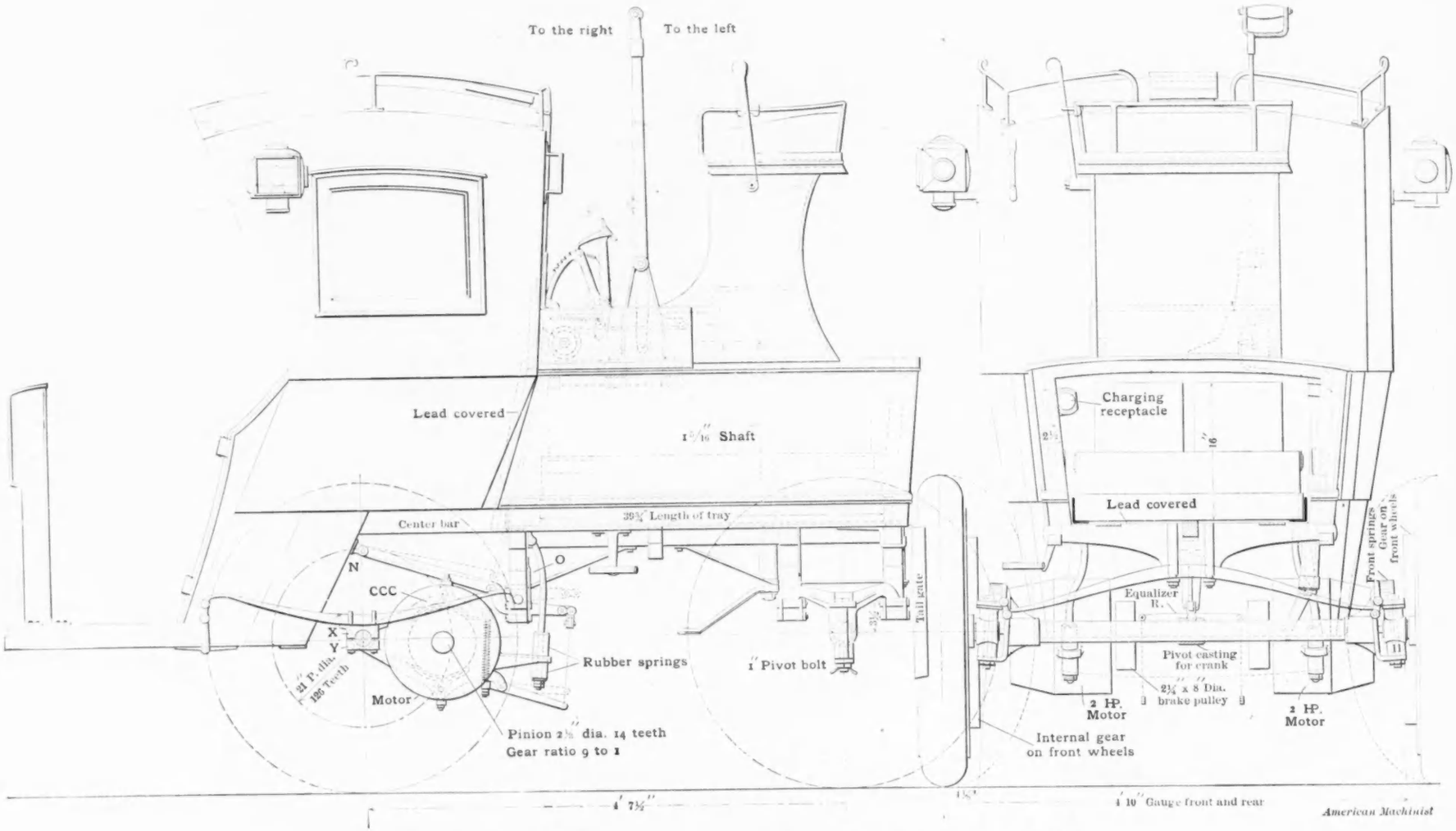


FIG. 7.—SHOWING MANNER OF ATTACHING BRONZE GEAR TO WHEEL.

Referring to the engraving Fig. 6, the wheel is made up of a central hub, two dished side plates struck up from sheet steel about 1-16 inch thick, and formed with the similitude of eight spokes, as shown. These side plates are bolted to a bent wood middle ring, against which the inside of the tire rests. The ring of internal gear is secured to the wheels by eight through bolts and sixteen dowels, and the hub flanges are secured by eight screws on a side. The axle bearings are plain.

It is of course necessary that the flanges, which rise on each side of the tire, should have their outside edges slightly flared, and this renders the flange liable to be crumpled up by coming in contact with a high curb or any



GENERAL DRAWING OF ELECTRIC HANSOM. ELECTRIC VEHICLE COMPANY, NEW YORK.

other obstacle. This crumpling happened in several instances, and created such an unfavorable impression that, although an entire equipment of the plate wheels was on hand, some spoked wooden wheels were made, and are looked upon very favorably. The plate wheels are now in course of being placed under the cabs, fourteen of which were in operation September 6, and these wheels are now regarded with less disfavor than at first. The stamped side-plates are too thin to stand truing up with a tool cut, and the gears are therefor fitted to each wheel separately, which is rather a slow job. Although the tires are not cemented to the wheel rims, they manage to stick very tight after they have been in place for a while, and offer a stubborn resistance to removal, so that it is by no means a quick or easy job to remove a damaged one. So far, except for a few punctures, the 5-inch tires and 60 pounds pressure have given no trouble; they can be cut quite easily, either crosswise or circumferentially, and as they cost about $30 each, the drivers are warned to watch the road for tire-lacer-

ating agents as much as possible. The low air pressure and large tire diameter make an extremely easy riding vehicle.

The working drawings of the cab are self-explanatory. The pins on which the steering wheel axles are pivoted are inclined somewhat, but not enough to carry the produced pin-axis to the point of wheel and road surface contact; this makes the wheels turn rather hard when the vehicle is standing, although the steering is fairly easy when in motion.

It may be mentioned that the spoked wooden wheel is just as liable to have the tire flanges crumpled up as is the plate wheel. The cost of the two styles of wheel is about the same, but the spoked wheel gives much the lighter appearance.

These vehicles have each a battery and a half, or 150 batteries for the 100 vehicles; the highly original and elaborate means employed for handling these batteries into and out of the wagons, together with various other details belonging to the electrical side of the company's work, will be shown in a subsequent paper.

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Swiveling, Angle-Iron Shearing Machine.

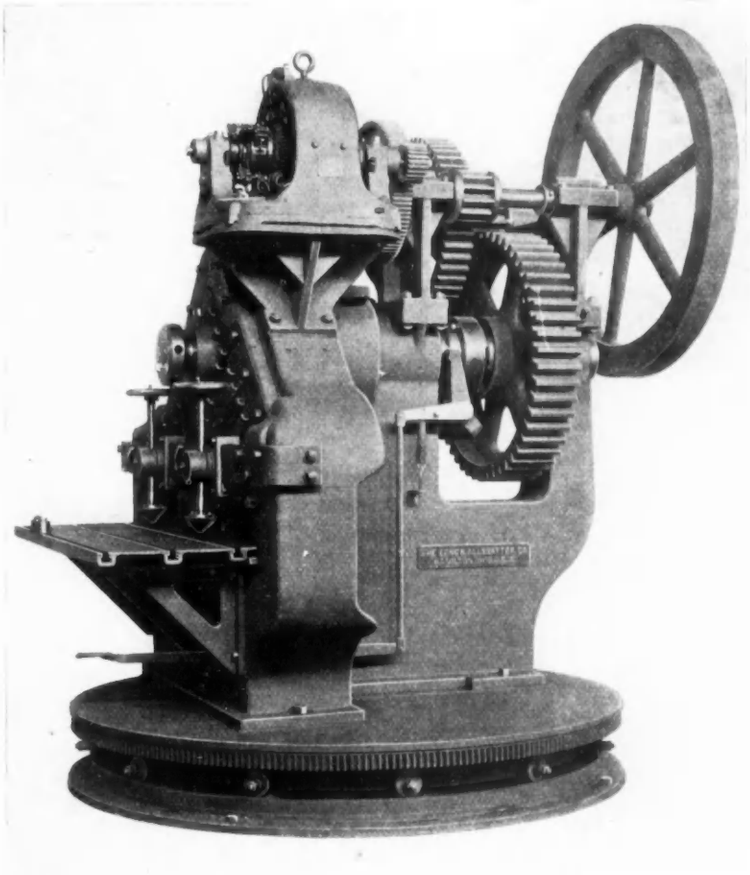
The accompanying half-tone gives an excellent view of a new angle-iron shear which embodies some new features and has just been brought out by the Long & Allstatter Company, of Hamilton, Ohio.

In cutting up angle iron for structural purposes it is often necessary to cut it at a miter or other angle, and the machine is designed to make these cuts as readily as square ones.

The table in front of the shear blades will be seen to be provided with adjustable gages for determining the angle to be cut. One leg of the angle shear blades will be seen to be vertical and the other horizontal—the iron being cut thus lying with one leg flat on the table against the gage at one point and against the shear blade at another, while a swiveling adjustable clamping screw enters the angle and holds it securely in position, crowding it both against the stops and against the work table.

It is clear that with a stationary machine the adjustment for different angles of cut would necessitate a large fan-shaped space in front of the machine, which would not only consume valuable space, but would involve extra handling of the stock. To avoid this the entire machine is mounted upon a turntable, and by a pinion and crank on the side opposite to the one shown the machine may be so turned that the stock shall occupy the same position regardless of the angle at which it is being cut.

A pilot wheel, seen in front of the machine, serves to operate the cam shaft by hand in setting the shear blades, while an automatic stop insures that the machine shall always come to rest with the shears open. The machine is obviously adapted to cutting both right and left hand, and is made in seven sizes adapted to the full range of sizes of angle irons. The motive power shown in the picture is an electric motor, which is now so popular in structural iron works for this class of work, but a steam engine is supplied in its place when preferred.



SWIVELING, ANGLE-IRON SHEARING MACHINE.

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Pattern Work That Helps the Molder.

BY JOHN M. RICHARDSON.

In pattern work there are many small and seemingly insignificant items which, if the pattern-maker would only realize and attend to them, would be greatly appreciated after the pattern reaches the molder's hands. The sticking of dowel pins is a source of annoyance to a foundryman, and one from which he really ought to be free, for it reflects directly back to the pattern-room, and, although a little thing, it is one about which a few words may not be amiss.

The requirements of dowels on a pattern are to keep each half in its exact position, so that the outlines will perfectly coincide, and, by the way, this is just as essential on the flask, and if either the halves of the pattern or the parts of the flask are loose or "shuck," as we say, then the casting is sure to tell the tale, and show a bad line where one half overlaps the other. It is not the length of a dowel pin that counts, but it is the fit, and there is nothing like metal pins for constant use, for when they are nicely mated they will never be affected by the dampness with which they come in contact in the foundry as do wooden ones. There are many kinds of metallic dowel pins used, but I prefer those which can be inserted by simply boring one size of hole in each half of pattern. In these the half having the pin or peg is shouldered down from the main diameter of the stock to a size fitting the hole or socket in the other half, so but one size of bit is necessary for boring.

For large work circular cast plates are best, having the peg in one half and the socket in the other, and each provided with three holes countersunk for screws. These can easily be made any size in proportion to the work on which they are to be used, and can also be put in with one size of hole bored with an extension bit.

Dowel pins should commence to taper

almost immediately; that is, their sides should be parallel but a very short distance up. On small ones 1-16 inch is enough for the straight part, and the taper should curve up to a point something like the sides of an acorn, although perhaps not so abruptly. The reason for having the pin commence to taper so near the base is to prevent sticking, and, as it simply is intended to hold the pattern from any movement sideways, long, straight sides would do no good whatever, but rather harm.

The worst imaginable form of pins are wooden ones, when they are put in as follows (this is a negative illustration, and *not* to be followed): Bore holes right through one half of the pattern into other half, without having them perpendicular to parting of pattern, and then drive in dowel rods so they project through the first half about three times their diameter or even more, and then whittle off the ends a little and see what happens when you try to fit the halves together.

Wood pins are bad enough at the best, for they are so apt to both shrink and swell, according to the temperature and moisture. They should always be made quite short, which will prevent their binding to a great extent. Sometimes, if they are inclined to stick, a little black lead rubbed over them will help matters somewhat.

In answer to any question covering the limit of a close fit for any kind of dowel on any ordinary pattern, I would give this simple rule. Lift the cope half, and if this can be done without disturbing the dowel half they are not too tight, but always bear in mind never to have any sideways play that can be detected.

When loose pieces are attached to a pattern by a dovetail they should drop freely into their places by their own weight. Many pattern-makers when putting a dovetail on a loose piece taper it on the two edges only, leaving the thickness parallel. This is wrong. The back as well as the edges should be tapered for this reason: When the main part of the pattern and loose piece separate the dovetail is freed from its place instantly when it commences to rise, and there is no chance for it to bind, but when it is made parallel it stands a good chance of sticking and causing trouble until it is entirely raised out of its socket.

When loose pieces are wired on, the wires should pass through freely, and on circular pieces one central wire is sufficient, for if the hole is in the exact center the position of the piece will remain constant.

In using wires for loose pieces and bosses one way to help the molder is to have them draw away in a direction calculated to cause him the least trouble when packing the sand about the pieces, and when they occur on the inner sides of a core box always put the wire through the outside of the box into the spot and not through the spot into the side of the box; by this means a wire causes the core-maker no trouble whatever, and after the core is rammed up the wires can be removed without disturbing anything. Back draft, that evil of pattern-making, need not be mentioned here, for no good workman will allow it, and the molder will be sure to curse the bad workman who does leave it on his work. A pattern can have its draft lessened on the outside until it becomes square in some instances, but that is the absolute limit, the "last straw," so to speak.

The marking of patterns is a greater help in the foundry than some pattern-makers realize, as the molder does not usually see the pattern until completed; whereas the pattern-maker is thoroughly familiar with every piece and core box, while the molder has no information except that conveyed by various marks and numbers on the pattern itself.

All things considered, I think patterns to be cast in iron should be varnished

BICYCLE WHEEL ASSEMBLING STAND.

black. The lampblack in the shellac makes a body for it which acts as a filler to the pores of the wood to a certain extent, and the hard usage which patterns receive in most iron foundries will not wear the black varnish off nearly as quickly as plain orange shellac. Core prints should be yellow, to distinguish them, and the back of every loose piece painted red; also the place on the pattern where the piece fits to be red also. This conveys a certain amount of information to the molder at the outset, and gives no excuse for any missing loose parts. The red is easily made by adding vermillion or Venetian red to common shellac. Whenever it is possible to set a core in more than one position in the mold, the core box should be fixed in some manner so that it will be impossible to place it in any except the right way. I have actually known of cores having letters on them to be placed so as to read upside down on the casting. It does seem as if this was inexcusable in a foundry, but some simple expedient which will take the pattern-maker but a short time longer to do will prove an effectual barrier to such carelessness. In many other cases it would not be carelessness at all if the core would fit the mold in two or three different positions, for the molder would have no means of telling except by guessing, and hardly any two men will guess alike when it comes to an uncertain point. To prevent this trouble cut off some portion of the core print and put its counterpart in the core box to exactly match, or else add some extraneous part of any convenient size to the core print and cut out the corresponding place in the core box to precisely fit. Sometimes one way is better and sometimes the other, and they both effect the desired result.

Another point on cores is this: Try to make the core box if possible so that it can be rammed up on the plate without having to be turned over to release the core. Have the box draw away sideways when convenient, and part in such a manner that it is freed from the core instantly without any dragging. This will insure a much more perfect core with a minimum amount of rapping. This is not always possible, but can be followed out in a great number of instances if the pattern-maker would only bear the point in mind, and also the reason for it.

In the matter of pattern-making it will benefit the foundry to have every loose piece and every core box numbered the same as the pattern, and on the main part of the pattern have the number of core boxes and loose pieces and stock cores plainly painted, in either red or white. Then the molder and core-maker can collect all the parts at the outset without inquiry, and, in addition, if the diameter of stock prints are marked on them the calipering process will not have to be resorted to.

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Bicycle Wheel Assembling Stand.

The accompanying illustration shows a bicycle wheel assembling stand made by the Fox Machine Company, of Grand Rapids, Mich. The machine is a development and improvement on the old machine made by the same parties, the improvements being intended to secure greater accuracy.

A series of bell crank levers will be seen to engage the rim while a post for the hub rises in the center. The levers are operated by a large horizontal hand wheel, which causes them to engage and center the rim. The central post is fitted

with suitable cones, and when the hub is placed on the post and the cones are tightened, the hub is obviously centered. To prevent springing of the central post by the tension of the spokes, the post is held at its upper end by the stays shown.

The inner ends of the bell crank levers are raised by a sliding sleeve, which is lifted by the threaded hub of the hand wheel, and between the sleeve and hub a ball step bearing is inserted, giving a very sensitive action to the tightening movement.

In the former machine, the lever pivots, of which there are twenty, were mounted in holes drilled in suitable bosses, but it was found impossible to insure exact uniformity in the radial distance of these holes, and in the present machine the pivot pins are dropped into a continuous groove, which is turned in the top plate—a method which of course insures positive accuracy in the radial distance, and the levers being made in special fixtures, a true circular form of the wheel rim is insured. The pivot pins are prevented from falling out of place by the caps which are seen between the levers.

The machine is intended strictly as an assembling and not as a truing stand, but, obviously, wheels which are assembled in their true shape will require less truing than those which are distorted in assembling, and it is claimed that when the rims are initially true and the operator puts uniform tension on the spokes, further truing is in many cases unnecessary.

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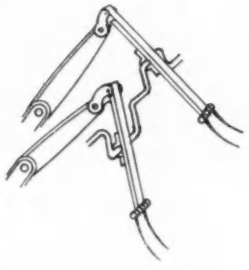
Influence of Natural Forms on Mechanical Designs.

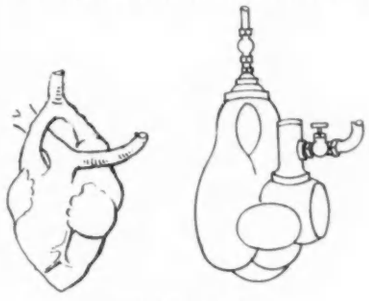
BY W. H. SARGENT.

Provided it is well adapted to the purpose intended, it is nothing against a design that it is copied. All ideas are



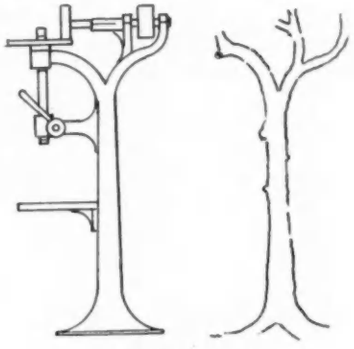
HAY-TEDDER.

new but once; man cannot always be original, and he soon acquires the habit of absorbing ideas relating to his business. He sees how beautifully some mechanical device accomplishes its purpose or how fitting is some shape or form, and unconsciously stores these ideas away in his mind and draws from



PULSOMETER.

them when needed. Probably the inventor of the hay tedder made no extended study of orthoptera, but only put to a practical use the action of the grasshopper which he had seen all his life. The hypodermic syringe is a pointed application of the principle of the sting of a bee, and it is reported that a successful tunneling system was designed from the



DRILL-PRESS.

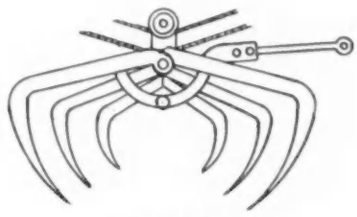
boring apparatus of an apple worm. A suspension bridge represents the highest mechanical, mathematical and engineering skill, and yet it is only the adaptation of a spider's web to man's requirements. Of all pumps the most common, the most reliable, the most efficient is the heart, and there is a significant parallelism between its form and the designs for some modern pumping machinery. Whoever has "caught a crab" while in bathing will remember the powerful grip of its jaws, and the inventor of the hay carrier seized upon the idea as the crab seizes upon the toe of the bather.

The pillar of an upright drill resembles a tree trunk in size and shape. It has limbs and branches. Naturally, then, the base, where stability is required, is modeled after the foot of the trunk.

In designing the supports for a heavy lathe it is but natural that the draftsman should cast about for some similar example in nature, and it certainly is not wholly by accident that the result resembles the supports of one of nature's heaviest machines, the elephant.

Sometimes the influence of natural forms appears in a real or fancied resemblance to some object which gives it a name, as an alligator wrench or a whaleback barge. Perhaps a monkey-wrench derives its name from its resemblance to a toy monkey running up and down a painted stick.

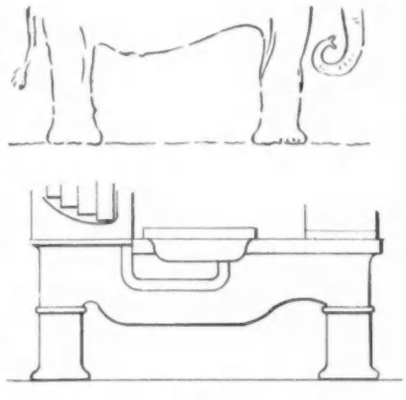
The tailor has his goose and the spinner his mule, and there are donkey engines and pony presses. The head of a ram is so manifestly adapted for butting that the ancient Romans carved it on the ends of their battering artillery, and



HAY-CARRIER.

while we have to-day abandoned the form we still retain the word "ramming."

Machines have bodies, feet and arms; they are provided with wrist-pins, knuckle-joints and elbows, and occasionally they break a rib or a leg like their human relatives. This shows the effect of natural forms on mechanical design; not that they are copied literally. The tree trunk is not reproduced with the bark on, nor the elephant's foot with



LATHE.

the toe nails, but they are adapted to man's purposes, "conventionalized," as they say in art.

In decoration nature's influence is even greater. "The heavens above, the earth beneath and the waters under the earth" all lend their products toward

decorative art. When man has exhausted his ingenuity he turns to nature for an inspiration, and if he copies her models in their proper relations he is usually on the road to success, but if he does not succeed the trouble is not with the originals, but with man's adaptation of them.

"Darius Green" doubtless had the wings of his "flying machine" elaborately modeled after the wings of a bird, but by neglecting to comply with some of the natural conditions under which the wings are used he not only failed to fly, but "lit on daddy's woodpile."

▲ ▲ ▲

Smoke Prevention.

BY W. H. BOOTH.

At the present writing there has been for some time a strike in progress in the South Wales coal industry. It is from South Wales that comes the "smokeless Welsh" coal that is so much used in London, regardless of its cost, by those who cannot master the firing of bituminous coal or who have been so unfortunate as to have been loaded up with steam boilers put in by engineers who either did not know or did not care anything about the probable future of the work. For some time past Welsh coal has been practically absent from the market for the above given reason, and many steam boiler owners have been hauled up before sundry magistrates to show cause why they should not abate the smoke nuisance they are making. These prosecutions take place under a certain law known as the smoke prevention act. A good deal of latitude is allowed under this act in cases where smoke cannot be entirely prevented, and steam users have been claiming in defense that as their furnaces are constructed for Welsh coal, it is impossible for them to burn bituminous fuel without smoke until the furnaces are altered, and in some cases orders have been made upon them to reconstruct these furnaces to burn bituminous fuel. In one case time to the extent of several months has been given to do this, and no doubt before this is done there will be plenty of Welsh coal and the change will be put off and put off, and the periodic Welsh strike will come again and we shall then see how these same steam users will answer the next prosecution for smoke with the present orders to reconstruct unfulfilled. Seeing that Welsh coal is so very much dearer than bituminous coal in London, in spite of the arguments of some engineers, who harp on the old string that the best fuel is the cheapest in the end, which they appear to do as a cover to their inability to use bituminous fuel, it is a little surprising that more effort is not made to burn the bituminous coal, especially as it can be burned without smoke under proper conditions.

When burning bituminous fuel smoke is sure to be made whenever the gases from the fuel on the grate rise directly upward among the tubes. This is the way the gases do escape in the ordinary construction of the majority of water tube boilers. In consequence, these boilers are sure to smoke badly with bituminous coal, and cannot be cured unless their furnaces are put into the shape of the ordinary furnace of a Scotch or other horizontal boiler, fired internally or externally. In these boilers the whole of the products of the furnace travel together over the fire and toward the bridge and become considerably intermingled and homogenized. If, when so mixed, the mixture contains the requisite amount of air, the whole of the gases will be completely consumed, provided they are still at a temperature sufficiently high to enable combustion to proceed. This is where one difficulty arises. If too much air be admitted this alone might cause smoke by excessive cooling, but the chief cause of cooling is obviously the comparatively cold plates of the boiler itself. If 1,000 or 1,500 degrees is a proper temperature for the gases, it is easy to see that a boiler plate at 350 degrees is a very chilly object indeed, and it is small wonder that freshly distilled gas from long flaming coal is cooled below the ignition point. In Lancashire boilers there are frequently water pipes placed across the internal tube beyond the bridge. So far as my experience goes, these are of little or no value as strength givers, and they are very effective in extinguishing nascent flames. When all these things are considered it is forced upon one's attention that to burn bituminous coal without smoke we must thoroughly mingle the gases with the correct amount of air and must prevent the mixture being too rapidly cooled. This latter can be effected by protecting the cold plates of the boiler by firebricks. It is because the sides of the furnace of the externally fired boiler are of firebrick that these can be made to give out less smoke than internally fired boilers of the Scotch type, in which usually the fire is cooled by a water arch all over the furnace area. The ordinary arrangement of the water tube boiler is however, about as bad as it can be designed to be. In fact, such boilers are only fit for coke and other smokeless fuels, as no attempt is made at gas and air mixture, but the gases are hurried straight up from the grate to the cold tubes and forthwith extinguished never to relight.

But there is an addition made to some water tube boilers in the shape of an extra row of water tubes, below the ordinary sets, and these tubes carry a roof of firebrick, so that the sides of the furnace and a portion of the roof are of firebrick, and this roof compels the products of combustion to travel to a point some distance along the furnace at which combustion may proceed. The chamber above this firebrick roof is also roofed in by a set of firebrick tiles supported on the lowest row of ordinary tubes, and thus there is good prospect of securing smokeless combustion. One thing more is needful—the correct amount and application of a secondary air supply above the fire. This is usually supplied above the door and often in a solid stream. The position is correct, but the manner is incorrect. The air ought to be supplied in a multitude of small jets directed toward the fire over its area so as to facilitate the mixture with the furnace gas. Thus mixed and kept hot the gases burn at the bridge, and continue to burn if provided with a sufficient space in which to complete their combustion. There is danger of using too much air. Chemically, the total air required in a furnace is twelve times the weight of the coal. The secondary air above the furnace is apt to be admitted too freely. Its admission should cease gradually after each fresh charge of fuel is coked off or it will produce waste. Hence the use of automatic devices to cut off the air supply at the proper time. It is desirable to have this secondary air admission made positive by means of a fan, in order that air may be blown in while firing is in progress, when the chimney damper is nearly closed and the under grate supply of air should be diminished, pending the closing of the door. But in shutting off the secondary air supply it seems likely that the best results would be got by shutting it off a section at once, instead of by gradually closing the admission valve for the whole. Thus if there be three perforated air jet pipes it would seem better to close them one by one, in order that those still open should spurt with their maximum pressure, than to gradually close three together and render the jets of air sluggish. If the foregoing precautions fail to prevent smoke, side firing may be also tried. It involves no more labor than ordinary whole surface firing. Side firing of a furnace measuring 6 feet long by 4 feet wide may perhaps be best carried out by firing upon alternate corners. Thus at one time fire the left front and the right back corners over an area each 3x2 feet, and at the next firing cover the other rectangles. This will tend to more even admixture at the bridge, and enables a simpler air admission to be contrived, though as a rule much attention is not given to this item. Recently I found air being admitted through a plain opening measuring 18x6 inches, an opening probably much too large in area and also admitting air unbroken and in a bad condition for mixing with the gases. Smoke, it is true, was being prevented, but probably at a considerable expense in the shape of excessive air and reduced evaporation per pound of fuel. It is well known that black smoke represents comparatively little in the shape of solid carbon, and that

the prevention of smoke cannot be effected with any certainty of economy of fuel. This is because it pays better to use nearer the correct chemical amount of air and produce some soot, because of more or less imperfect mixture, than to pour in a larger excess of air and completely prevent smoke. This points to the great importance of minimizing the secondary air by introducing it as finely divided as possible. Clearly, with a sufficiently long refractory furnace tube, thorough admixture of the air would be effected and every particle of gas would be satisfied with its molecule of oxygen. But practical considerations limit furnace dimensions, and it is practically impossible to reduce air supply to its chemical minimum. With a chimney draft, attempts at proper admixture often defeat themselves by paralyzing the draft. Herein comes the advantage of mechanical draft, which can be made to fit any conditions we are likely to impose. It is thus seen that the combustion of bituminous fuel is a compound operation; the solid carbon burns on the grate by means of air admitted below the grate and the volatile hydrocarbons burn above the fire by means of air admitted also above the fire. In each case the air requires admission in fine streams. This compound operation demands the draft to be varied to suit the fuel, and with chimney draft it is often the practice to have light dampers to the ash pit so as to regulate the air admitted below the grate. This can be effected by means of the usual blast gates where the forced draft is employed. We have thus a considerable control over the rate of combustion of the solid fuel on the grate, but we have not much control, if any, over the rate of combustion of the hydrocarbon evolved from the green fuel. This fuel is thrown upon the fire, its hydrogenous gases are evolved quickly, and we must supply them with air or smoke will be made. As a rule, if fairly well arranged as regards fine division, the loss due to smoke prevention arises from the air supply being too long left on, and an automatic closing device is required to prevent this. An advantage of externally fired boilers so much employed in America is that a steeply sloping stepped grate may be used under them and fed by some mechanical means on the coking system, and the fuel may be made to travel sufficiently quickly down the slope to prevent an excessive flow of air coming through the grate. This cannot be done with English boilers, which are usually fired internally, and the problem of economical mechanical stoking is very much more difficult here than in America, for a fire cannot be made to travel and pack close upon a horizontal grate, no matter how the bars lift and creep. With gravity to aid this can be done, and if anything brings about the use of water tube boilers here, probably this question of mechanical stoking will have as much as anything else to do with it.

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The Swiss Machinery Trade in 1897.

The machinery industry of Switzerland is in a flourishing condition. In 1897 the total exports amounted to a value of $6,650,000, as against $5,859,000 in 1896, an increase of $791,000. The value of the imports was $5,364,200 in 1897, an increase of $646,000 over 1896. The relative proportion of imports and exports remained about the same in both years.

The large increase in the exports for 1897 was mainly due to the output of dynamo electric machinery, of which $1,654,800 worth was exported, being $559,200 more than in 1896. In general machinery there was an increase of $528,200, the total amount exported being $2,420,200. Other items showing an increase were: Steam boilers, $150,200—increase, $49,800; parts of machinery, $58,000—increase, $57,000; sewing machines, $40,000—increase, $15,000.

Against this the following decrease in the exports took place: Weaving machinery, $117,800; spinning machinery, $139,800; embroidering machinery, $67,000; flour mill machinery, $101,600.

The increase in the number of workmen employed in the manufacture of machinery was, on the other hand, very small, being 21,179 in 1896 and 21,954 in 1897. This showing, in the face of a remarkable increase in the exports and consequently in the production, can only be accounted for by the fact that the factories are being more and more fitted for the use of partially manufactured materials, the import of which is steadily increasing, and by the further fact that there is a continued improvement in the mechanical devices employed in the production of the machinery.

As regards financial results, there was no material improvement over the previous year. This is especially true of the prices obtained for finished manufactures. The prices of raw material and half finished products showed a falling tendency. Wages have remained unchanged, except in the manufacture of specialties, in which they have somewhat declined.

In the canton of Zurich especially all the electric machinery manufacturing plants are overwhelmed with orders, owing to the high reputation achieved by their products abroad. Dynamos, turbines and motors of all kinds have been constructed in all sizes and of enormous dimensions in some instances. An improvement in the construction of centrifugal pumps such as are used in waterworks has opened a new field for the near future.

The demand for turbines is steadily increasing, owing to the constant opening up of new electric centers. In shipbuilding several large orders are being filled. The construction of locomotives is equally in demand, and the numerous new mountain incline railways and street railways create a steady demand for new cars. There have been numerous orders received for machine tools, but orders for machinists' small tools were not so numerous, German competition being marked and effective in this line.

As mentioned above, the value of the total imports of machinery in 1897 was $5,364,200, mainly from Germany and Great Britain. Our direct share in this trade is very unimportant, as may be seen from the following table representing our exports to Switzerland during the last five years:

	1893.	1-94.	1895.	1896.	1897.
Agricultural machinery.....	..	..	..	$20	$1,589
Sewing machines..	..	..	$100	..	..
All other machinery.....	$158	$1,583	1,200	10,528	14,948
Saws and tools....	621	298	1,644	1,888	1,143

By proper efforts, however, we should be able considerably to increase our share, especially in machine tools. But Switzerland, as well as many other European markets, has been and is being neglected to a large extent by our manufacturers. It is true, the Swiss are good mechanics themselves, but if we are able to supply the German and English, the Belgian and French markets, there remains no reason whatever why we should not be able to participate in the Swiss trade. It may be added that there seems to be a good field in Switzerland for American typewriting machines. Previous to 1897 there were no exports at all direct from the United States to Switzerland, while in that year the value of our typewriting machines shipped to that country was $10,768. As another item in which our trade increased somewhat may be mentioned bicycles, of which we sent $224 worth to Switzerland in 1896, and $2,283 worth in 1897. H. L. G.

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Japan's New Tariff.

Under the provisions of Japan's new tariff law, which will pass into effect January 1, 1899, the duty on manufactured iron and steel will be 10 per cent. ad valorem; on pig iron, 5 per cent. ad valorem; machinery, other than that intended for agricultural purposes, will be subject to a duty of 10 per cent., while agricultural machinery and implements will only be assessed with duty at 5 per cent. of their value. Locomotives and parts, engines and boilers for ships, and parts of same, will all be dutiable at 10 per cent. ad valorem.

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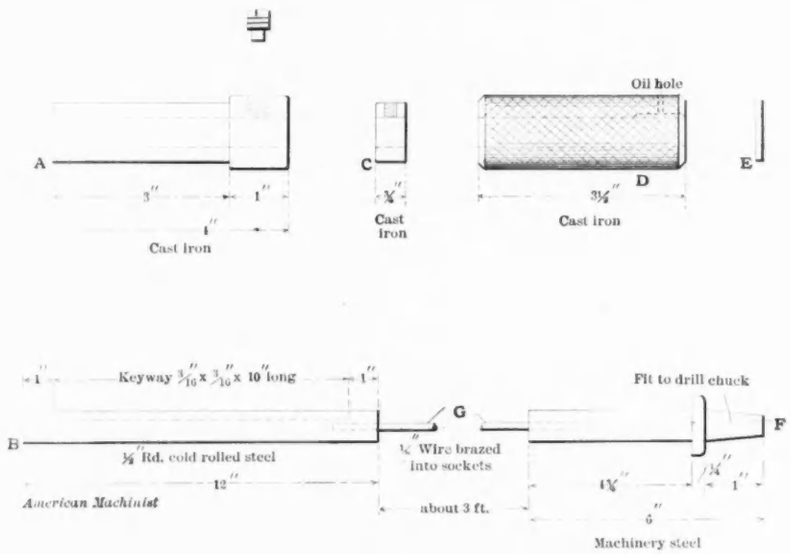
Heavy tool building seems to have recovered its old-time activity; the shops are busy and in some cases crowded. Foreign orders form a large proportion of the total business.

Letters from Practical Men.

A Flexible Driller.

Editor American Machinist:

We had some men working outside altering a mash tub. This tub was 9 feet diameter and the bottom consisted of eight removable segmental plates of ⅛-inch copper perforated with 3-32-inch holes, ½-inch centers each way. Allowing for ribs and openings there were about 34,000 holes in all. Our outside foreman came to the shop and reported, with a subdued grin: "The engineer out there wants you to send out a half dozen 3-16-inch twist drills with bitstock shank. His super. wants him to drill out the holes in the mash tub plates while we are fixing up the paddles." Our men had four or five days' work on their part of the job.



A FLEXIBLE DRILLER.

We sent the drills, and waited for developments.

The next day a team appeared at the shop with eight shiny copper plates. About the same time came a telephone message from that super. saying that he had sent in those plates to have the holes enlarged to 3-16-inch diameter. He was not particular how we should do the job, but suggested using several hand punches 3-16-inch diameter with a centering point to engage the old holes; but he laid down the law on these points: The plates must be left smooth on the top surface and perfectly flat, and they must be ready to go back to their place before the paddles. With some misgivings as to results, we made the punches as suggested. A short trial demonstrated that this method would be very hard on punches, tediously slow and would bulge the plates in spite of all precautions. Next came a council between the toolmaker and the writer. The former sighed for a flexible drill. We did not possess one, and could afford neither the price nor the time to wait for one. So we made a drill, flexible within limits, about as shown by the sketches.

A 12-inch hollow spindle lathe, 4 foot bed, was stripped of its tailstock. The piece *A* was chucked by its 1-inch body, the 1¼-inch head projecting clear of the jaws. The spindle *B* was made a loose sliding fit in *A*, and after inserting *B* in *A* the set screw was screwed down until its pivot point engaged the slot in *B*, so that *B* was rotated by *A*, but was still free to slide endwise about 10 inches, the slot ends preventing *B* from coming out of *A*. A soft Bessemer steel wire rod *G* about ⅛-inch diameter, long enough to reach the end of the lathe bed, was brazed into the center of *A*. This wire was similarly fastened into *F*, a spindle carrying at its outer end a small drill chuck. This spindle *F* ran loose in the knurled sleeve *D* carried in the operator's hand. The fiber washer *E* took the drilling thrust and the set collar *C* the pull to withdraw the drill. The plate to be drilled was slung overhead by a rope fall and clamped to two temporary uprights, close to the end of the lathe bed, made of rough spruce boards, supported and braced from the floor. The endwise movement of the drill was permitted by the sliding of spindle *B* in sleeve *A*, and the wire was sufficiently flexible to cover about a square foot of the plate; that is, about 576 holes at one setting. Up and down adjustment of the plate was obtained by the use of the rope fall and sidewise adjustment by a simple swinging movement from side to side.

It took about a day to make and rig up the drill with which we did the job in a little over four days, or at the rate of about 8,000 holes per day.

F. C. Blanchard.

Wide Cuts—Reforming Machine Shops.

Editor American Machinist:

Unquestionably your illustration on June 16 of a shaving 12¼ inches wide, taken on an ordinary planer, has awakened fresh interest in the subject of wide finishing tools. In your issue of August 25 Mr. George A. Steinle presents some interesting specimens of special work done, no doubt on special tools, in which cuts as wide as 4 inches were taken.

It is not my purpose to discuss or question the propriety of using specially wide tools on machines that are designed with reference to such work, but I do think that finishing cuts 6 to 12 inches wide, taken on ordinary planers or lathes, are impracticable. The fact that such cuts are possible does not prove that they can be practically employed as time savers or as a means of improving the quality of work. Wonderful exploits of this kind are a little misleading when viewed by the office man or anyone who has had no practical knowledge of work in the machine shop. In the first place, ordinary machine tools are not sufficiently rigid for such work, and this is no reflection on the maker either, for he does not contemplate such service being required of them. In the second place, the cost of keeping up such tools, together with the extra time necessary to adjust them, would, I think, more than offset any gain made by the fewer number of cuts required to finish a piece.

Every planer hand knows how difficult it is to so grind and set a finishing tool, even of 2 inches in width, so that the juncture of one cut with another will not be marked to such a degree as to make the work unsightly or actually unfit for use. If such be the case, how much more difficult will be the task of adjusting and holding a tool 10 or 12 inches in width so that it will not spring up, dip down or perform some other freak common to things out of the regular order.

I do not wish to be understood as at war with the pacemaker. On the other hand, I have a high regard for his service, and can sympathize with anyone who may undertake to bring about reform in a shop where old ruts are very deep. To do this it might seem best at times to discharge the whole force and begin on new material, it being quite as hard for persons to unlearn bad methods as it is to learn better ones. For these and other reasons it is next to impossible, I think, to effect any very great improvement in shop methods through the efforts of an old management, however much they may realize the necessity of such a course.

It is really pitiable to see how much time and money are sometimes fruitlessly spent in bungling efforts in this direction.

only to relapse sooner or later into the old ways.

Nothing, perhaps, is better calculated to thwart the efforts of the real pacemaker than are preconceived notions, gathered by the employer from reports of wonderful performances in other shops, where the work performed is really of quite a different character from that which he is doing, and hence no correct comparison can be made.

QUIRK.

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Deep Well Pumps.

Editor American Machinist:

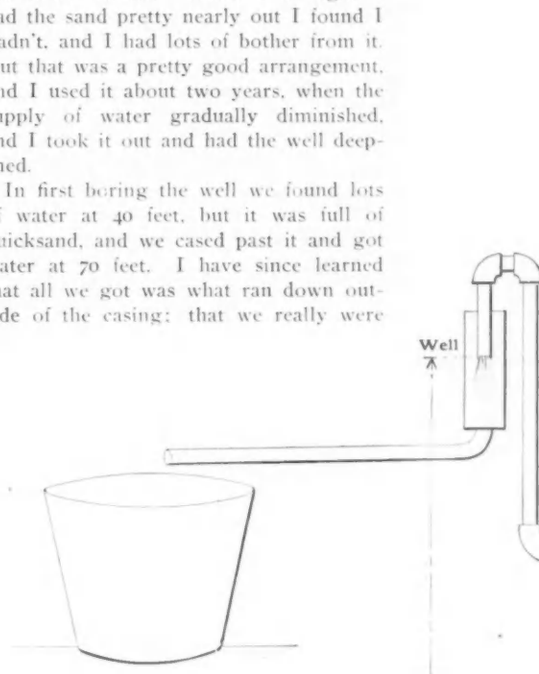
Mr. Booth's article on deep well pumps in the last copy of your paper found me just ready to digest it, for the very day after reading it I had the pleasant experience of a broken ring on the piston of my own pump dropping under the bottom valve and stopping the flow of water.

I have been wrestling with the deep well pump problem for about nine years, and some of my experiences are as interesting as a summer vacation. After my well was drilled I began the hunt for a "wherewith" to get the water out, and found a firm out West who particularly recommended a barrel and sucker they had and I got one. It was one of the kind where the barrel, which was 2½ inches in diameter, was at the bottom of a well full of the same size pipe, through which the sucker was expected to drop to its proper place. I was not lucky enough to find any 2½-inch pipe large enough to let the sucker in, and I did the next and only thing I could do—put the sucker in and piped above it, using a ¾-inch pipe for the rod. Now 2½-inch pipe is pretty heavy stuff to get in and out of a well, and although the well at the time was only 70 feet deep I found it quite a bother, especially as I had to keep the ¾-inch pipe inside of it all the distance. I was greatly pleased to have it work after I got it all placed, but only to find that there was sand enough in the well to wear that sucker out the very first day. I don't like that kind of a pump unless one had the power upstairs where they wanted the water discharged. Of course one could put a cap on top and a stuffing box and pipe the water out one side and up where they wanted it, but I was not contented with it one minute.

My well has a 6-inch casing, and I could use the same barrel, put a smaller pipe under it, with the discharge pipe one side of it, and still have room for both in the well, and I arranged it in that way, fastening wooden blocks on the pipes to hold them upright and so they would be fairly free from being loose.

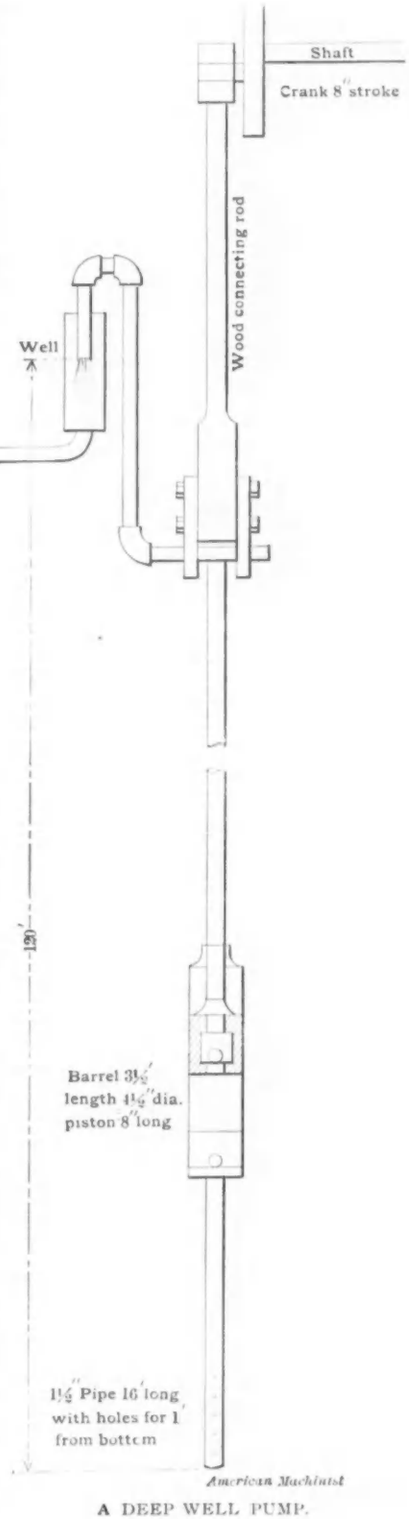
With that arrangement I could put the barrel and 1-inch pipe, through which to force the water, in first, and put in my other parts afterward. I made a plunger 18 inches long, the barrel being 4 feet, and made it a nice sliding fit, pointing the end so it would easily drop into the barrel, the water being pushed up on the down stroke. While I thought I had the sand pretty nearly out I found I hadn't, and I had lots of bother from it. But that was a pretty good arrangement, and I used it about two years, when the supply of water gradually diminished, and I took it out and had the well deepened.

In first boring the well we found lots of water at 40 feet, but it was full of quicksand, and we cased past it and got water at 70 feet. I have since learned that all we got was what ran down outside of the casing; that we really were not in any deep water system at any time.



After going down 35 feet deeper and through 30 feet of rock we struck "pay dirt" in a substantial quantity of good sweet water. I knew I had lots of mud to get out, and I made a new cheap pump of 4-inch cast iron water pipe, boring it and fitting a piston with rings. I made the piston this time with packing rings sprung in; made it with a hole through and rubber ball valve inside, and used for the pump rod 1¼-inch pipe, the connection being such that this pipe also served as a water pipe, as will be seen from the sketch. I put one length of 1½-inch pipe below the barrel, put the piston in and had a cap on the barrel, through which the pump rod was centered and which had holes in it, so that the water in the barrel above the piston could flow in and out. Then I dropped the whole thing in the well and put a tee on the top of the 1¼-inch rod for my connecting rod, piped off one side of the tee, took the water above my machinery just where I wanted it and with a return bend led it to a well of 3-inch pipe and from thence to a tank.

It looks very simple to see it working—just the one pipe in sight—and after I got the mud all out it performed so well I let it stay right there. I like the piston and ring packing first rate, but this one being of cast iron has not lasted long. I am now reboring the barrel—not much worn; and now that there is no great amount of mud I shall make a babbitt piston straight and smooth, 8 inches long, and try it again. Ninety



A DEEP WELL PUMP.

feet of 1¼-inch pipe, with the piston and the water, made quite a load to lift, but the weight is not enough to force the water up when on the down part of the

stroke. While the work seems to be done on the down stroke, the water is really lifted inside of the pipe on the up stroke, and the pipe is pushed over the water on the down stroke. Take it as it now is it is a very good hydraulic machine.

F. P. AVERY.

Tunkhannock, Pa.

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Duplex Steam Hammer—Displacement of Workmen.

Editor American Machinist:

I was much interested in the description of the duplex hammer in the Horwich shops. This kind of hammer, if I remember correctly, was brought out by the late Mr. John Fernhill Ramsbottom, and exhibited, I believe, in the '62 Exhibition. It was, however, actuated by one cylinder instead of two, this cylinder being placed below and immediately between the two hammer heads, the cylinder standing vertically, with the piston rod coming out at the top and connected to both of the hammer heads with a connecting rod, so that with the upward stroke of the piston the hammer heads were forced apart, the reverse of course being the case with the indoor stroke. The piston rod and two connecting rods being like a capital Y, with the two upper arms of the letter more or less open, as the hammers are either away from or close to the work. A full description of this hammer was given at the time in the London "Engineer," but I forget the date.

I notice in the "American Machinist" of September 8 you have an item which does not appear to be an exact copy from the London "Engineer." Had you commenced the quotation with the following paragraph it would put the matter in a slightly different light:

"A leading Sheffield manufacturer, who makes very frequent visits to the States, is especially emphatic on the superiority of American machines and the way they are worked by American workmen. There are other considerations to which he also attaches importance."

So that you see it is not the opinion of the "Engineer," but the opinion of this Sheffield manufacturer. Although I know of more than one instance where practically the same changes have been gone through, one particular case is now in my mind where American workmen were employed. Trouble arose and Irishmen were put in their place; these again were discharged to make room for imported Italians, and I believe since, although this is not of my own knowledge, a change has been made replacing the Italians with another class of labor imported from Europe. Although this case was not a machine shop, still I do know in the case of a machine shop where Americans were displaced for workmen from Europe, and again, in a recent number of the "Engineering Magazine," an instance is given where just the same stages of displacing one nationality of workmen for another had occurred; so that even if it had been the opinion of the "Engineer" it would not have been so very far wrong.

I was very pleased to read your short article on "Piecework and Peace." Piecework on the plan usually adopted has the most pernicious effect on both the employé and employer, and in very few cases is the object attained, namely, lowering cost of production; whereas on the premium plan all parties are working to the same end, and harmony prevails.

FREDERICK HART.

Poughkeepsie, N. Y.

[The error consisted in describing as a regular feature of our American labor market what is only an occasional happening.—ED.]

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An Unsafe Angle-Valve.

Editor American Machinist:

Mr. Tecumseh Swift, August 11, has said considerable that is true and to the point in regard to pipe fittings. It is a lamentable fact that there are a good many cheap and unsafe fittings made and

A BROKEN ANGLE-VALVE.

sold, and it may be the demand for the 67 and a lengthening row of 10's as discount from the price list that fosters the manufacture of such, but at any rate the existence of poor fittings is by no means a new danger. The manufacturers, however, should have the credit for progress during the past few years in standardizing the sizes of flanges and in producing a line of extra heavy fittings with which little fault can be found.

Some time ago I gave an account in these columns of the failure of a cast iron elbow, one side of which was very thin, nearly all of the metal being on the opposite side. This was an original defect in the casting and should have been discovered by somebody before the elbow was finally used, and yet this elbow stood a high pressure for a long time before giving way.

With this communication I will illustrate a broken 3-inch angle valve that had been in constant use on top of a boiler for over twenty years. In fact there has never been, to my knowledge, an hour's time when steam was not on this valve, either from the boiler to which it was connected or from some other one of the system. I do not think, however, that this fact has been unfavorable to the condition of the valve, for it seems probable that intermittent use with accompanying changes in temperature and expansion would sooner provoke a fracture than where, as in this case, the conditions remained the same.

The area where the fracture occurred was about 4.7 inches, and the thickness of the metal varied from .03 inch to .09 inch, with a total cross section of about .29 inch. The average pressure has been 80 pounds, which would give a constant load of 376 pounds carried by this .29-inch cross section of composition of an unknown quality and disposed in a bell-shaped form between two rigid parts. The breaking strains of good average materials are pretty well known, but as this part broke when the valve was being closed, and as the extra jack-screw strength of the average fireman on a 7-inch hand wheel is an unknown quantity, we shall simply have to say that in this case it was in excess of the remaining margin of safety there was in the metal at the point of fracture.

It is a matter of conjecture whether the part was originally cast too thin or was made so in finishing to a prescribed size. It is but fair to say that a defect of this kind would be very likely to pass an ordinary inspection without discovery.

There were no measurements taken of the velocity of the projectile (the fireman), but from its penetration into a pile of coal some 20 feet away, and the flue not being carried away, it is evident that its course was first slightly elevated from the horizontal, and then with a sharp curve downward to point of contact.

PETER H. BULLOCK.

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Shell Pointing Device for the Lathe.

Editor American Machinist:

While in the shops of the B. W. Payne Company, of Elmira, who have a subcontract on steel and cast iron projectiles, the writer saw the rig shown in the

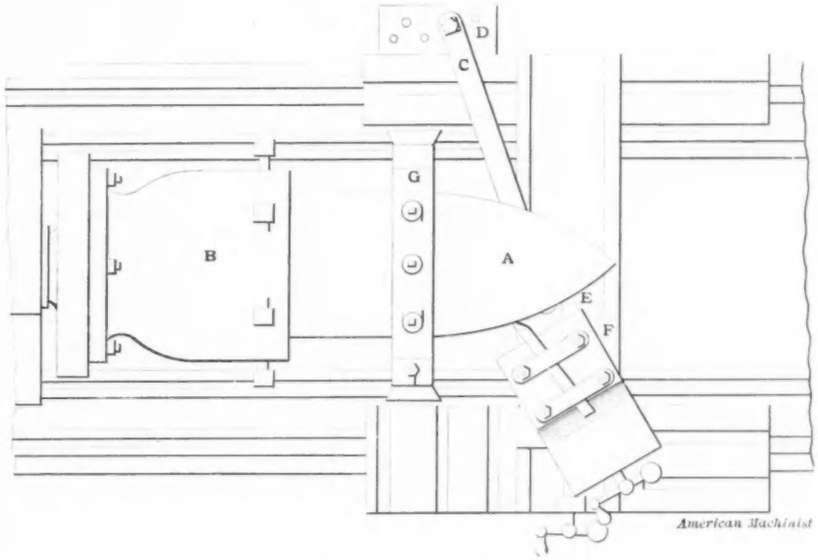
sketch for tapering off the points of the death dealing missiles of Uncle Sam.

While the scheme is nothing particularly new, the application is interesting not notice any attachment for tapering the points.

FRED. E. ROGERS.

Corning, N. Y.

▲ ▲ ▲



SHELL POINTING DEVICE FOR LATHE.

in conjunction with the hollow chuck and heavy steady rest.

They were finishing the last of a lot of 13-inch shells, and the radius bar *C* appeared to be about 25 inches long. It was pivoted to the stationary block *D*, which had a number of holes tapped in various positions for the different sized projectiles, and at *E* to a piece bolted to the lower slide rest *F*. The driver is the heavy cast iron chuck *B*, which is hollow and deep enough so that the set screws shown can be gripped ahead of the groove turned in the base for the copper collar. This groove is turned in dovetail section or so that the bottom is the widest, and then is well knurled with a coarse knurling tool.

This is presumably to prevent the copper from turning in the groove when under the immense strain subject to turning the shell in the rifling of the gun when fired.

The steady rest *G* is designed for just such heavy work, and has five points of support, three of which are above the center as shown.

Owing to the fact that the countershafts had been put up and speeded for working cast iron, some of the lathes were running at a speed above that which was economical of time spent in grinding tools, but were on the slowest speed obtainable.

The steel of these shells was not, however, the fearfully intractable stuff that many are led to believe, but appeared to be about as hard and tough as some locomotive tires.

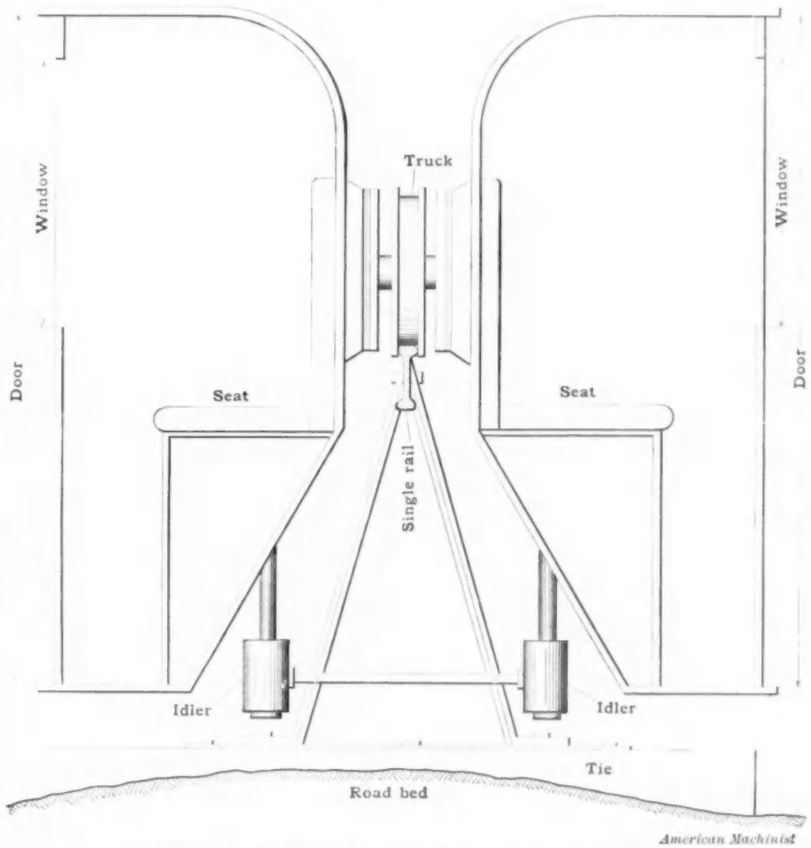
A number of Gisholt machines have been installed for turning, boring and threading the cast iron shells, but I did

An Irish Railroad.

Editor American Machinist:

The Listowel & Ballybunion Railroad is a single rail line of the Lartigue system, and connects Listowel, which is the principal market town of this county (Kerry), with Ballybunion, a watering place on the west coast of the same county, and is eight miles in length. I had sufficient curiosity to indulge in a trip over the line a couple of days ago, and I inclose a pencil sketch showing a cross-section of the car or carriage and line. The latter consists of a single rail of the I-beam variety, supported at intervals of about 4 feet by a light A frame and at a hight of 4 feet from the ground. The cross ties in the A frame extend slightly beyond the inclined sides of the same and support small side rails or bars, along which the idlers at the bottom of the carriage run. The carriages are double-connected along the center, where they are supported by double-flanged wheels, which run on the single rail at the top of the A. The coal burning locomotive is also double—a boiler and firebox on either side of the rail, connected and supported on a set of double-flanged driving wheels 16 inches in diameter and driven by four small direct-connected engines. There is no communication between the cars or compartments on either side of the rail, and passengers can look out only on the side they are riding on. The horrible grinding, squeaking noise at the back of each compartment, coupled with the rattling of loose windows and the efforts of many passengers to carry on conversation during the trip, was simply awful.

The run of eight miles in either direc-



SECTION OF CAR AND TRACK ON THE LISTOWEL & BALLYBUNION RAILROAD.

tion, including one stop of two minutes, was made in 47 minutes. The fare for the round trip is 2 shillings (50 cents). I was informed that it is the only road of the kind in the United Kingdom.

WILL E. GOLDEN.

Killarney, Ireland.

▲ ▲ ▲

The Humpage Reducing Gear.

Editor American Machinist:

Upon examination this gear resolves itself into two combinations (1) a modification of the sun and planet wheel and (2) a differential gear. It is possible to so proportion this gear that the driven shaft will revolve in the same direction as the driver or in the opposite one, and with any desired reduction. This is illustrated by the following figures:

In the figures (1 and 2) A represents a fixed rack, D a movable one, and B and C gear wheels connected together

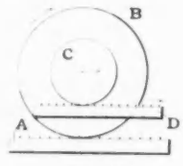


Fig. 1

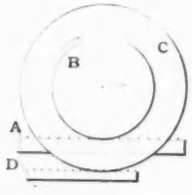


Fig. 2

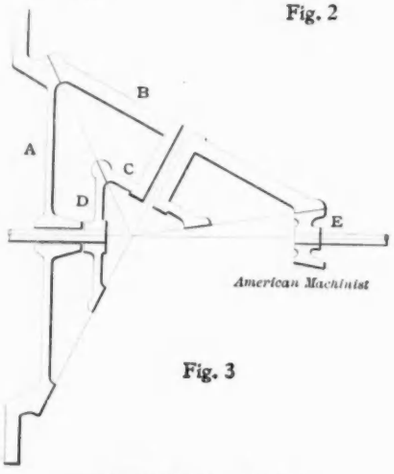


Fig. 3

THE HUMPAGE GEAR.

and meshing into racks. In Figs. 1 to 3 parts having similar functions are represented by the same letters.

In Fig. 1 the movable rack travels in the same direction as the wheels, but in Fig. 2 its motion is in the opposite direction.

If the gears are proportioned as in Fig. 3 the system acts as a pair of bevel gears, and no motion of D results.

Let a = number of teeth in A

b = number of teeth in B, etc.

By geometry

diam. A : diam. B : : diam. D : diam. C.

$\therefore \quad a : b : : d : c.$

And $\quad a\,c = b\,d.$

$\therefore$ when $a\,c < b\,d$, D revolves in the same direction as E.

and when $a\,c > b\,d$, D revolves in the opposite direction.

To rotate the gear system about the main shaft once E must revolve $\frac{a+e}{e}$ times. During one revolution of the system, supposing C locked, D would advance d teeth. But in reality C is not locked and would turn D back $\frac{a}{b} \times c$ teeth.

So when $\quad a\,c < b\,d,$

D revolves forward $\frac{d - \frac{a\,c}{b}}{d}$ revolution.

and when $\quad a\,c > b\,d,$

D revolves backward $\frac{\frac{a\,c}{b} - d}{d}$ revolution.

$\therefore$ ratio reduction is $\frac{\frac{a+e}{e}}{\pm d \mp \frac{a\,c}{b}}{d}$ times

By this formula I find the ratio of the experimental gear illustrated in the issue of August 4 to be 10.534 to 1.

H. V. FOREST.

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For the Emancipation of the Molder.

While it is never possible to doubt that improvements in practice and in achievement must continue to develop as heretofore in all lines of manufacture, it is not easy to predict, and indeed it never has been easy to predict, wherein the improvements will consist, or even in what direction they are to be looked for, and it is more difficult to make such predictions concerning some departments than concerning others. It is, for instance, probably to-day more difficult to suggest the possibilities for striking and decided advances in the machine shop than in the foundry, and this notwithstanding the fact that for, say, a decade or a score of years, there has already been more gained in the ways of making metal castings and in the operations connected therewith than in those of cutting and shaping, and adapting them to their intended functions thereafter.

The lines of operation in the foundry and in the machine shop are entirely different from each other, as different as are the trades of the miller and the baker, and while our hopes of progress must still rest largely if not entirely upon the aid of machinery, its application must be as different as could well be imagined in the two cases. In the machine shop the tools largely supersede and render superfluous the minute skill of the individual workman. But it is not, at least not yet, in the niceties of fine manipulation that the aid of machinery is to be invoked for the foundry. It is not the skill of the fingers, but the strength of arms and legs and backs that machinery is called as yet to replace in the foundry. There is still altogether too much crude muscle work in the foundry. The men of the foundry work too hard. Old molders are much scarcer than old machinists. Most of the hard work is clearly unnecessary and avoidable, if only the ways rather than the means can be devised by which the steam engine or the water wheel may be made to shoulder the burden. The ways will open before the advancing trade if only the eyes are keen to discern them. Foundrymen have not yet got into the habit of thinking of machinery for their work, as the machinist does. The operation of breaking pig iron by manual labor is going on as it has for a century beside our cupolas all over the land. Two foundrymen were the other day discussing the making of the pigs so that they could be broken more easily, and deciding regretfully that it was hardly possible to do it. They said not a word about a mechanical breaker for the pig iron, one of the simplest of machines, and, apparently, a complete solution of this, one of the littlest problems of the trade.

While it is, as far as we see yet, mostly simple operations for which mechanical devices can be employed in the foundry, the value of its help being in the great amount of work to be done rather than in the difficulty of any individual operation, the problem of so arranging operations as to make this help available is still a most difficult one, but, as we believe, not incapable of a happy solution. The air hoist and the molding machine have come into the foundry and have done much to help the individual molder, and to turn the attention of the trade toward the possible ameliorations and accelerations to be accomplished by mechanical devices. The traveling crane also is kept busy in all the shops that it gets into, and suggests its own general supersession later by systems of continuous conveyors. The conveyors, with other devices and arrangements already in sight, seem to promise a very general transformation of the foundry. The molder of the future will have easier work and his time will be more continuously employed upon the same or similar operations, and it cannot be doubted that he will turn out more, better and still cheaper work.

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As showing the extent to which milling machines have been developed, we have recently seen a machine of the planer type with horizontal spindle built by the Newton Machine Tool Company, of Philadelphia, and made with a carriage 6 feet wide, 10 feet long and with a capacity for admitting work 7 feet wide between the uprights, and for raising the center of the spindle 6 feet above the platen. The spindle of the machine is 7½ inches diameter and the total weight is over 66,000 pounds.

A Loose Nut—A Wrecked Fly Wheel.

The annual report of the chief engineer of the (British) Engine, Boiler & Employers' Liability Company for the year 1897 analyzes the causes of the engine breakdowns of the year. The following is perhaps the most noteworthy accident mentioned:

"One of the most serious breakdowns of the year resulted from the unscrewing of one little nut. This nut was at the back of the lever on the end of a Corliss steam valve spindle on the high-pressure cylinder of a triple-expansion engine. It secured the pin to which the dashpot rod was fastened. When it came off the pin dropped out of the lever, and the latter being thus freed from the pull of the spring remained stationary when liberated by the trip gear instead of closing the valve and cutting off the steam. The speed of the engine began immediately to increase. The operatives in the mill took fright, threw off the machinery and fled, fortunately, just in time to save their lives, for before the engine man, who was in another engine house, could shut off the steam at the boiler junction valves, the fly-wheel burst. The engine house was wrecked, the wall dividing it from the mill and the fireproof ceilings of the first two floors were cut through by the flying lumps of metal, and the machinery in the line of flight destroyed. In this case a lock-nut and split pin would probably have proved a good investment."

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Goodyear's Work.

The current issue of the "Popular Science Monthly" contains an interesting article by Clarke Dooley on Goodyear, in which it is shown that he never received a tithe of what he should have received in proportion to the benefits his inventions bestowed upon the world and the lifelong sacrifices and labors he endured in developing them and in experimenting. In granting an extension of his patent in 1858 the Commissioner of Patents said: "No inventor, probably, has ever been so harassed, so trampled upon, so plundered by that sordid and licentious class of infringers known in the parlance of the world as 'pirates.' The spoliation of their incessant guerrilla warfare upon his defenseless rights has unquestionably amounted to millions." An important French work on rubber ("Le Caoutchouc et La Gutta Percha," by E. Chapel) says: "Sufficient account has not been taken in the United States of the character of this researcher; it is owing to him that we have been able to take so great advantage of caoutchouc; that its employment has become indispensable in medicine, in chemistry, in physics, in electricty—in a word, in all the arts and sciences, in which, in many cases, it permits the realization of progress of the highest importance. We should consider Goodyear one of the benefactors of his race, and must regret that no statue to that end has been raised to this Bernard de Palissy of the New World."

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Machinery Business in Germany.

Mr. A. Roper, of the firm of De Fries & Co., of Dusseldorf, Germany, who recently arrived in this country on a business trip, reports that the machinery business in Germany continues to be excellent, and that he has no reason to suppose that it will be otherwise for some time at least. He states that while Germany's export of machinery is considerable, yet the chief demand for American machine tools there has its primary cause in the development of German industries. He states that business at home is generally good, that the railroads must be extended to handle the increased business offered them, that they have been increasing their rolling stock as rapidly as possible and that the enlargement of existing roads and the construction of new ones will soon be imperative.

Regarding the movement there for increased tariff duties, Mr. Roper thinks that nothing can be done in this line before 1902, and that before that time some change may occur which will further postpone or avoid such a contingency. Bearing on this same matter, the report of Mr. Wertheim is that the movement for an increase of duty will be unsuccessful, because, he says, . was tried some years ago in the case of sewing machines with absolute failure. Yet he thinks a movement now in favor of higher duties on bicycles and other machines might possibly be more successful, as conditions are somewhat altered, our high tariff on machinery being especially helpful to those Germans in whose interest it is that the German tariff should be increased.

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Some Large Tools.

We have already mentioned the very large pumping engines to be built by the Lane & Bodley Company, of Cincinnati, for the water works of that city. A local paper contains an account of some of the tools being built for the work by the L. & B. Company, and says: "The making of the great engines for the new water works will necessitate greater facilities than the company now has, and there are already being made some gigantic machines and machine tools for the work in hand that will have to be put up in a new establishment. Four of the machine tools that will be put up, and that are now building, will be record-breakers, beating in size anything that there is in the world. One of these will be the big planer, the largest in the world, which will be 16x16x56 feet in its working parts, 112 feet long and 32 feet high. The largest boring machine in the world will be set up in the new plant, having a diameter of 32 feet, a swing of 32x16 feet, and being 32 feet high. The third world's record-breaker will be the hydraulic press, which will have a nominal capacity of 500 tons and be capable of 1,000 tons. It will have a 4-foot stroke and be 38 feet long. The key-seating machine will cut a key seat in a wheel hub 5 inches wide and 4 feet long."

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Expert Advice on Inventions.

Our attention has been called to a valuable service rendered by the Franklin Institue, through its Committee on Science and the Arts, in the examination of inventions.

This committee will undertake to examine any invention submitted to it, and to report on its merits. In cases of superior merit one of the medals of the institute is awarded, but without regard to this the examination should often be of service in determining whether an application for a patent is advisable. Our attention is in fact called to the matter by a correspondent who had thus submitted a modification of the steam engine indicator, which had been reported on adversely. The reasons given for the adverse report satisfied the inventor, who therewith dropped the matter.

The services of the committee are gratuitous, but a charge of $5 is made to cover expenses. Full particulars may be obtained by addressing Dr. William H. Wahl, Secretary Franklin Institute, Philadelphia, Pa.

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The N. A. S. E. at Pittsburg.

The National Association of Stationary Engineers held its seventeenth annual convention in Pittsburg week before last, and the meeting was a very successful one. Among its other pleasant features was an excursion to the works of the Westinghouse Machine Company, at East Pittsburg, where, after an inspection of the works, a banquet was given the visitors by the company in the erecting room. About 600 guests sat at the tables.

Reports of officers showed the association to be in a healthy condition.

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It is claimed to be practicable to draw seamless tubing from 10 gage to 16 gage at a single pass by a process recently patented by Mr. Ellwood Ivins, of Philadelphia.

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A pulley covering, which increases belt adhesion and which can be applied in the same manner as paint, is made by the O. C. Pulley Coating Company, Menasha, Wis.

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The "Practical Man" and the Engineer.

Many so-called "practical men" are firmly convinced that no one who has been through a technical school course can possibly know much. At least they think that none of that particular brand of knowledge which enables men to really and truly know things about machinery can be absorbed except through overalls, and some of them even go so far as to think that the greasier the overalls the better their conducting power. On the other hand, there are many technical graduates—sometimes called "theoretical men"—who are equally firm in the belief that no man who has not graduated from a technical school ought to be trusted with any responsibility in connection with engineering work, or to do anything more than drill holes, file and otherwise exercise his muscles in removing sand, humps and surplus metal from forgings and castings. They are firm believers in the theory that overalls, especially greasy ones, are complete insulators of knowledge—*i. e.*, of that particular kind of knowledge which enables men to reason about machinery—to "do sums" regarding it and to decide what particular machine should be used for a given purpose or to design one to accomplish specified ends. Both these classes of men are of course grievously mistaken, but their benighted condition does no particular harm except when it leads to an eruption of bragging and self-adulation in the meetings of the A. S. M. E., where unoffending and well disposed persons attending in the line of duty or to gain instruction are obliged to witness egregious strutting and listen to ignorant and more or less cantankerous misrepresentation of each side by the other, besides having their time wasted by utterly useless talk that can, from the nature of things, convince no one nor produce any effect whatever except to give listeners "that tired feeling."

Those who may have harbored the hope that we have outgrown such things are, it seems, doomed to disappointment. The disease in its worst form has broken out in the columns of our esteemed contemporary, the "Engineering News," a contributor to which excellent journal tells us of a municipal body which employed a plumber when it should have employed an Engineer; whereupon the editor regales us with a tale of an engineer who had charge of a large steam plant located on the bank of the Hudson River, and who could not get rid of his exhaust steam in an inoffensive manner. It transpired that this man did not know that such things as condensing engines existed, because forsooth he was only a "practical man," had never been to a technical school and had merely "spent the better part of his life as a stationary engineer," in which occupation, as is well known, a man may be expected never to hear of any other kind of engine than the one he happens to open the throttle of, nor of such things as independent condensers, and should never be consulted as to a method of disposing of exhaust steam. Our esteemed contemporary, in the same issue, gives an account of a break in a pumping engine at the Grand Rapids, Mich., water-works, as follows: "The pump was on the Holly direct system, of 7,000,000 gallons capacity, and had been running without a stop for four months. The plunger rod of one of the plungers, which was 5 inches in diameter, and turned down to 4¼ inches at the screwed end, stripped its screw heads, drawing itself out of the nut, which was 4½ inches thick. The engine then began to race, but it was stopped before any further damage was done. The calculated pressure exerted by the plunger, which is 25 inches diameter, working against a pressure of 90 pounds per square inch, is 4,488 pounds. The metal to be sheared by stripping the threads could not have been much less than 50 square inches even if the threads were of the weakest form, or square threads, giving a very large factor of safety against ordinary stresses. It is probable that the nut had worked loose, and that this occasioned a hammer blow upon the threads, which in time would cause them to break."

There can be no doubt as to what manner of man made those figures and told us "how it happened." No "practical man" could have done that. And even supposing that a "practical man" could have done this sum he would have hesitated to publish his results, because he would have reflected that no engineer in charge of a water-works pumping plant would allow a "hammer blow" to remain a feature of his engine which "in time" would destroy it. In other words, your "practical man" would bank somewhat on engineers' well-known antipathy to "hammer blows" about their engines, and would think the "probable cause" almost anything else than that assigned.

Thus in one breath, so to speak, are we made to see clearly some of the differences between "practical men" and real Engineers, and to realize that among both classes there may be found, alas! men who are ignorant of things they really ought to know.

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Questions and Answers.

Name and address of writer must accompany every question. Questions must pertain to our specialties and be of general interest. We cannot undertake to answer by mail.

(91) K. K., Chicago, Ill., asks for an explanation of the term "moment of inertia." A.—If a body whose mass is M moves with a velocity v, the stored energy due to the motion is $\frac{M v^2}{2}$. If, however, the body revolve upon an axis, as, for instance, a grindstone, it is plain that no such simple formula will express the stored energy, for the reason that different parts of the stone have different velocities, and a factor must be introduced to provide for this fact, which factor will obviously vary with the shape of the revolving body—a square disk, a round disk or a cone each having a factor of its own. This factor is called the moment of inertia, and it is found by multiplying the weight of each particle of the body by the square of its radius, and adding together all the products. This process in only possible through the methods of the calculus, although approximate results can be obtained by simpler methods. The expression "moment of inertia" is an unfortunate one, as it conveys the impression that it is the moment of the inertia of the revolving body, whereas in point of fact it is only the factor of that moment due to the shape of the body. It has sometimes been proposed to call it the measure of the moment of inertia, and such a name would better describe what it really is, but the practice has not prevailed, and probably never will prevail. It so happens that in treating of the subject of the strength of beams a mathematical expression is found which is identical with the above-described moment of inertia, and consequently it is called by the same name. You will find this expression running through all discussions of the strength of beams, although in point of fact there is no inertia and no real moment of inertia involved in any body to which static forces only are applied. The use of the term in that connection grows out of the coincidence in form of two formulas obtained in very different classes of work. In our issure of April 16,

1896, you will find an article on this subject by Mr. Walter Ferris, which will give you a very tangible idea of what moments of inertia, as applied to strength of beams, really are, and how, by simple mathematical methods, they can be found with sufficiency accuracy for most purposes.

(92) S. W. R. Silao, Mexico, asks: What is the best material to polish aluminum and what is a good lacquer to apply to it? A.—Aluminum can be polished on a buffing wheel with rouge, the same as brass, and for polishing any considerable quantity of sheet this, of course, is the most economical way. In the absence of any special aluminum polish, several of which are now sold, ordinary cold brass polish will be found to answer, provided it is ground fine enough. A polish which bears the name of the "Acme" is good for this purpose and consists of stearic acid, one part; fullers earth, one part; rottenstone, six parts. The whole should be mixed and ground fine. Use a fine white rouge or tripoli and a chamois skin buff, although it is often polished with an ordinary rag buff. Aluminum is seldom lacquered, but the ordinary lacquers answer for it.

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The International Correspondence Schools, Scranton, Pa., have sent us a prospectus containing information regarding their course in telephony. The course covers the principles of telephony, construction and method of operation of apparatus, an investigation of the various systems, telephone lines and their construction, etc. Previous to the student undertaking this study he requires some preliminary instruction, which is given in the following subjects: Arithmetic, algebra, elementary mechanics, principles of electricity and batteries—calculated to give students an intelligent idea of the principles of electrical science, enabling them to understand its many applications in telephony. This course is intended for electrical engineers, electricians in the navy, etc., enabling them to make estimates for and superintend the construction of telephone systems. Mr. Kempston B. Miller, recently of the Western Telephone Construction Company, is in charge of the instruction in this subject.

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Sibley College of Cornell University has been presented the original Paige typesetting machine, which is said to have had nearly $2,000,000 expended upon its construction. It is in every detail a beautiful specimen of fine and accurate work, comprises more than 19,000 parts and is considered the most costly machine in the world. It was the gift of Mr. P. T. Dodge, a patent attorney of New York and Washington, and president of the Linotype Company of New York.

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The Post Office is now a savings bank which anyone may use. A recent order from the First Assistant Postmaster-General authorizes postmasters to issue money orders payable at their own offices. Chordal years ago suggested in our columns the use of the post office money orders by young mechanics who have a weakness for spending money foolishly. The fact that no interest is paid on deposits, and that, in fact, the depositor must pay a small fee for the privilege of depositing, is only a slight drawback to the facility and security afforded. The orders may be cashed and invested elsewhere when a sufficient sum has accumulated, and in the meantime the important habit of saving something continually is cultivated.

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According to a press report the naval engineers are elated over an encomium bestowed by Rear-Admiral Schley upon Milligan at Santiago. After the battle Milligan had occasion to go aboard the Brooklyn, where he was greeted warmly by Schley, who threw his arms about his neck, and said: "Milligan, you did it! If it had not been for the Oregon we should not have captured the Cristobal Colon." The Union Iron Works, which built the Oregon, has presented Mr. Milligan with a handsome Swiss watch, ornamented with designs of Tiffany's devising. It bears the inscription: "To Chief Engineer R. W. Milligan, from the Union Iron Works. Your zeal and devotion to duty have added fresh laurels to your profession."

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Next week we shall publish an intensely interesting account of the engineer's part in the work of sinking the "Merrimac" at Santiago. This account is written by the chief engineer of the vessel, and we take it that no mechanic will wish to miss reading it.

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The largest single-piece casting in statuary bronze ever made in the United States was poured August 22 by the Henry-Bonnard Bronze Company, of this city. It was a reclining figure of the god Pan, more than 13 feet long, for Central Park, and weighed 4 tons. The molding of the statue was begun November 5 last and work was continued upon it up to the time of pouring. The metal is ninety parts copper and ten parts tin, with 2 per cent. of zinc added.

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Personal.

G. S. Williams, C. E., of Michigan University, has been appointed professor of civil engineering at Cornell University.

Mr. A. Roper, of the firm of De Fries & Co., Dusseldorf, Germany, is visiting this country, his chief object being to purchase machinery.

Mr. Paul Wertheim, who is associated with his father, Mr. Thomas Wertheim, of Frankfort, Germany, in the manufacture of sewing machines, under the name of Deutsche Nähmaschinenfabrik, is visiting this country with a view to seeing what is new and useful in the way of tools and appliances for sewing machine manufacture.

Mr. E. P. Earle has been appointed superintendent of No. 2 machine shop of the Bethlehem Iron Company, and Mr. Harry Leibert consulting superintendent.

Mr. Walter Böker, representing the firm of Schuchardt & Schütte, of Berlin, is visiting America on business, and expects to remain until some time in December.

George C. Russell, formerly with Park Brothers, has accepted the position of secretary and treasurer of the Grant Ball Company and the Grant Machine Tool Works, Cleveland, Ohio.

Mr. Harold F. Massey, of the firm of B. & S. Massey, engineers, Manchester, England, arrived in this country recently for the purpose of visiting American machinery-building establishments.

Mr. Frank Mossberg, of the Mossberg & Granville Manufacturing Company, Providence, R. I., arrived in New York on the 7th inst., after a seven months' tour of Europe in the interests of his firm.

Passed Assistant Engineer F. M. Bennett, U. S. N., late of United States steamship "New York," has been selected as a representative of the United States Navy on the Paris Exposition commission.

Mr. D. F. Broderick, of the Pratt & Whitney Company, Hartford, Conn., sailed for Europe August 20. He is to take charge of the tool-making department of the Typograph Gesellschaft Company, Berlin, Germany.

Prof. R. E. Chandler recently resigned his position as adjunct professor of drawing and machine design at the University of Nebraska to accept the professorship of mechanical engineering at the Oklahoma Agricultural & Mechanical College, Stillwater, O. T.

The mechanical engineering department of Clemson Agricultural College, Clemson, S. C., has been placed in charge of Prof. William H. Boehm. Professor Boehm was formerly instructor in mechanical engineering at Worthington University, St. Louis, Mo.

In our issue of September 8 we stated that William A. Fannon, superintendent of the Valley Iron Works, Appleton, Wis., had been appointed receiver of the company named. We should have said that Mr. Fannon was superintendent of the plant of the Manufacturing Investment Company.

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Obituary.

Joseph H. Shireman, an old-time machinist, died at York, Pa., September 17, seventy-two years old. He conducted a machine shop early in life, building agricultural implements, in East Berlin, Pa.

Later and for many years he was in the same line at York.

Chief Engineer George R. Johnson, U. S. N., retired, died at Washington on the 16th inst. He was in his seventy-first year.

Henry S. Mack, who was for twenty years superintendent of machinists in shops of the L. & W. B. Company, died at Wilkesbarre, Pa., September 17, sixty-five years old.

Mr. George Washington Wood, of Conshohocken, Pa., died on the 7th inst. Deceased was connected with the firm of J. Wood & Brothers Company, iron founders, of which he was for a number of years vice-president and general manager.

William H. Lewis, the oldest employé of the Carnegie Company, died at Braddock, Pa., September 15, seventy-nine years old. Mr. Lewis was born in Wales and came to Johnstown, Pa., in 1844, and became master puddler for the Cambria Iron Company. He went to Braddock in 1874, and was master puddler for the Carnegie Company eighteen years. He was employed as a night watchman for the company up to the time of his death, having been stricken with paralysis while on duty.

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Inquiries for Machinery.

Those who make, or may know of the makers of such machinery as is called for below, will oblige us by sending name and address, mentioning the number of the inquiry. We cannot forward catalogs. We have inquiries as follows:

67—From England, for makers of machinery used in the manufacture of twine.

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Purdue University.

Purdue University entered upon the work of a new term on the 14th inst. under conditions favorable to an excellent year's work. The engineering laboratory, so well known to engineers, has during the summer been supplemented by the addition of a room 50x100 feet, known as the railroad laboratory. In this room the equipment of machines for testing strength of materials and the brake-shoe testing machine of the Master Car Builders' Association are already in place. There is also a fine full-sized model of the front end of a Richmond compound locomotive and an exhibit of typical steel car trucks. The equipment of this room will be completed during the fall by the installation of the air brake testing rack of the Master Car Builders' Association.

The number of students matriculating for the new year is larger than for several years past. The freshman class will number about 200, nearly two-thirds of whom are in the engineering courses.

There are but few changes in the corps of instructors in the engineering department. Mr. Leopold O. Dense, for several years senior instructor in mechanical engineering at Lehigh University, has been appointed an instructor in machine design, and Mr. Robert S. Miller, assistant in the engineering laboratory, has been made instructor in the mechanics of machinery.

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Steel Works in Japan.

Out of a total appropriation of 13,600,000 yen the Japanese have appropriated 4,000,000 yen for the establishment of steel works; of that amount 2,500,000 yen will be spent in foreign markets for machinery. According to the original program the yearly consumption of steel in Japan was estimated at 120,000 tons, and the original design was for a plant that would turn out annually about 60,000 tons. However, since the war with China the demand for steel has risen until it amounts to 240,000 tons at the present time, and the authorities have decided to enlarge the equipment of the establishment so that it will be possible to have an annual output of 90,000 tons by April, 1901, and to 180,000 tons later on. It is intended to commence with the manufacture of plates and bars, and to extend operations as the workmen become competent, until the manufacture of guns will be undertaken. A. F. T.

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Commercial Review.

NEW YORK, Monday Evening, Sept 26.

THE ENGINE MARKET.

If the condition of the engine market were to be judged by the hum of industry in certain shops, no one could doubt that a business millennium had arrived. Considered in its prosy spots as well as its poetic, it does not average up very differently from last month, yet the change, in our humble opinion, is at least perceptible and for the better.

Although the possibility of an early advance in prices is still regarded in the market with some incredulity, it is stated in certain quarters that actual advances have been made. Conditions are not yet such as to justify an increase of the sum asked for the average engine, and if one were to throw open a contract to miscellaneous competition he could secure terms as favorable as ever before, or more so. Yet if he were intent upon securing an engine from some one of certain leading manufacturers he would be confronted by higher figures than would have been named six months ago. Representatives of at least three builders of engines of the Corliss type so state of their respective machines, and this appears to be true to some extent in the high speed class also. Higher cost of raw materials are stated as the cause of the stiffening in price of one of the Corliss engines referred to, yet this is insufficient to account for all cases. We are definitely informed that 25 per cent. more is now being asked for the American Wheelock engine than three months ago. If this were not quite so good an engine as it is, and the factory not quite so well filled with work as at present, the advance would be a better criterion of general business conditions.

In conversation with the New York manager of a New England engine company the following views were given as to conditions in several industries from which the demand for engines proceeds: "The engine market is now exhibiting a decided improvement in activity. The textile mills in the South are placing contracts freely, although conditions among those in the New England district are about stationary. Paper mills are more alert than they have been before in ten years. Street railway work in large cities is also active. Rope drive transmissions for industrial purposes are very popular and are becoming more so every day."

The Buffalo Forge Company writes us in somewhat the same connection: "There could be no better indication of the revival of business activity among the textile mills of this country than by the number of orders recently placed for the equipment of new buildings." Orders for an outfit for the Sayles Bleacheries, Saylesville, R. I., and for a heating and ventilating equipment for the Fashion Knitting Mills, Arcade, N. Y., are mentioned; also a contract to build the induced draft apparatus for the power plant of the Howland Paper Company, Sandy Hill, N. Y., in which will be two large fans, which will have water cooling bearings and will be direct connected to engines.

The Watertown Steam Engine Company has not in twenty years had such a large force employed as at present, and several obtainable orders have had to be allowed to escape because of the time limit. Such was the fate of one from Japan, one from Germany and two from this city.

The Lane & Bodley Company, Cincinnati, Ohio, is inviting bids upon a new machine shop structure 60x200 feet. Proposals will be received until October 1. The structure in immediate contemplation is expected ultimately to be extended to cover several acres. For it and the subsequent buildings machinery of various sorts will doubtless be required in due time.

The E. P. Allis Company numbers among its latest business some large contracts from steel works in the Pittsburg district for engines to drive rolling mills, blowers, etc. The Ames Iron Works have made good sales lately around Boston. The Metropolitan Railway Com-

pany, Washington, D. C., is adding to its plant a 1,250 horse-power McIntosh, Seymour & Co. engine. More work than ever before is going through the shops of the Harrisburg Foundry & Machine Company. It comprises fifty engines.

As may be seen by consulting the export statistics in a later part of this report, the foreign shipments of engines this year do not present the pleasing contrast with those of last year that is noticeable in some lines of machinery. This may be because of the effect of the war upon the Spanish-American market, upon which the foreign demand for engines is more largely dependent than that for machine tools. There is now some complaint of sluggishness in closing foreign engine contracts, and we fail to hear of much work of importance, but would not pass too hasty a judgment upon the matter. In recent export engine orders that have come to notice Mexico, Japan and South Africa are represented.

Among contracts taken within three months past by the American Wheelock Engine Company the following may be mentioned in the manufacturing line: For the Pajebscott Paper Company, Maine, 900 horse-power; for the Willamette Pulp & Paper Company, Oregon, 500 horse-power; Bibbs Manufacturing Company, Macon, Ga., textile mills, 800 horse-power; Chicago Portland Cement Company, 1,200 horse-power. We understand that all of the above engines are to drive the machinery by shafting and belting, which disproves the assumption that electrical transmission has carried everything before it. Three or more American Wheelock engines for driving dynamos have, this season, been purchased by the New York Light, Heat & Power Company.

Bids to furnish a steam plant, in addition to other important work upon extensions to the Manhattan State Hospital at Central Islip, N. Y., were received up to the 22d inst., but it was stated to-day at the office of the commission that the contracts would probably not be awarded for several days. The machinery equipment will include twelve 150 horse-power boilers, two 100 kilowatt alternating current generators, two 160 horse-power engines, beside smaller engines for the stokers, etc.

"The prices of boilers will surely go up," was the remark made to us by the New York manager of a well-known water tube boiler company. The opinion was based upon the increased cost of plate and tubes and upon a betterment in the tone of the market noticed in that office; also upon an inference derived from the peculiar circumstance that the sharp competition existing between certain other companies was going to cease. We have investigated this latter ground, and do not find that it is very substantial. Another leading concern remarks an improved business and a stiffening tendency in prices. This is not a universal report, but on the whole the tone of the boiler market is becoming more cheerful.

The Kings County Electric Light, Heat & Power Company is now installing 3,000 horse-power of Stirling water tube boilers. The East Jersey Water Company is erecting a pumping plant at Little Falls, N. J., in which will be used 500 horse-power of Heine safety water tube boilers, to furnish steam for a pumping outfit made by the Dixon Manufacturing Company, Scranton, Pa.

Late sales of Oil City tubular boilers include 200 horse-power for the Kewannee Manufacturing Company, Jersey City, N. J.; 400 horse-power for the marble works of Volkeming & Co., Astoria, N. Y., and 200 horse-power for Dublin, Ireland. The Bigelow Boiler Company is feeling an improved business tone. The orders it has taken have been scattering ones for factory extension, etc.

REVIVAL IN ROLLER SKATES.

We have received from Mr. M. C. Henley, Richmond, Ind., manufacturer of iron working and other machinery, and also of roller skates, a letter in which he calls attention to a revival of interest in roller skating which he believes to be of considerable significance for firms that make this class of goods. A renewed interest in the subject was apparent the winter before last, and still more in evidence last winter, and the present season bids fair to excel any since 1884 in this respect. Many old rinks are being refitted and restocked with skates, and in various parts of the country new ones are being built. As an illustration of the demand for skates, an order has been received from the proprietor of the Farwell Rink, in Milwaukee, for 400 pairs of Henley Club, to be fitted with ball-bearing wheels, and it is expected that 1,000 pairs of that make will be in use there before the season ends. Since Mr. Henley is a manufacturer of the first magnitude in this line his observations cannot but carry weight with others interested in it.

AN ENGLISH MOSSBERG COMPANY.

Mr. Frank Mossberg, of the Mossberg & Granville Manufacturing Company, has returned after seven months in Europe, during which he has established agencies in the principal European countries and taken orders sufficient, we are advised, to keep the works busy for several months to come. About half their product is now shipped abroad. While in England he organized a company called the Mossberg Roller Bearings Company, London office, 6 Victoria street, which will work in harmony with the American company, though having no direct association therewith. The new factory will be equipped with American machinery and tools. Mr. Mossberg believes that in the face of European attempts at improvement American manufacturers of machinery will require determined work to maintain their present superiority.

MACHINERY EXPORTS FOR JULY.

The latest number of the "Monthly Summary of Finance and Commerce" shows that exports of metal working, electrical and shoe machinery, and of pumps, have now been separately stated in the classification for a month over a year, and so for the first time it is possible to make a comparison of the amount shipped during the month with that for the corresponding month of the previous year. In both metal working and electrical machinery large gains are shown this year as compared with last.

For the month of July, 1898, metal working machinery exports amounted to $401,100; for July, 1897, $267,286. The figures for June, 1898, have previously been reported—$453,752. For the seven months ending July, 1898, they are $2,978,895. Electrical machinery exports were: For July, 1898, $161,481; July, 1897, $64,839; June, 1898, $169,258; seven months ending July, 1898, $1,296,592. Pumps and pumping machinery: For July, 1898, $166,056; July, 1897, $159,828; June, 1898, $187,998; seven months ending July, 1898, $1,233,756. Shoe machinery: For July, 1898, $44,797; July, 1897, $54,020; June, 1898, $62,852; seven months ending July, 1898, $535,333.

Exports of other lines of machinery included: Locomotive engines, for July, 1898, 70 in number, valued at $635,766; July, 1897, 24, at $167,988; June, 1898, 49, at $454,054; seven months ending July, 1898, 369, at $3,200,092; seven months ending July, 1897, 203, at $1,904,437. The figures upon stationary engines are: For July, 1898, 39 in number, at $21,325; July, 1897, 71, at $32,162; June, 1898, 43, at $21,553; seven months ending July, 1898, 315, at $233,590; seven months ending July, 1897, 328, at $205,555. Upon boilers and parts of engines they are: For July, 1898, $106,209; July, 1897, $56,759; June, 1898, $47,441; seven months ending July, 1898, $625,491; seven months ending July, 1897, $343,756. Upon printing presses and parts thereof they were: For July, 1898, $34,484; July, 1897, $56,888; June, 1898, $56,497; seven months ending July, 1897, $381,088.

MISCELLANEOUS.

An order has just come from London to an American tool company represented in this city for eighteen lathes of various sizes to be sent to Glasgow.

It is reported that the Carnegies will build at Homestead, Pa., a gun manufactory rivaling that of Krupp in Germany. Rumor has it also that the Illinois Steel Company—meaning, presumably the new Federal Steel Company—will erect an establishment of that nature.

According to a United States consular report, the exports of instruments and

machinery from Germany during the first half of the present year as compared with the corresponding portions of the preceding four were as follows: 1898, $22,657,600; 1897, $20,468,000; 1896, $17,255,000; 1895, $16,826,600; 1894, $14,613,200.

The bid of the Heine Safety Boiler Company to install steam generators in the League Island (Pa.) Navy Yard has been accepted. It was $5,133. The Babcock & Wilcox Company's bid was $5,500 and that of the Aultman & Taylor Manufacturing Company $5,469.

A contract for two traveling cranes and runways for the New York Navy Yard was awarded to Alfred Box & Co., Philadelphia, at $9,400.

The Falls Riverton Machinery Company, Cuyahoga Falls, Ohio, has received from the Government a contract to supply 100,000 3-pounder steel projectiles.

In a report from Consul Ragsdale, Tientsin, China, it is mentioned that the Chinese Government has contracted with Mr. Difenderfer, of Philadelphia, for the purchase of a complete machinery equipment for an up-to-date woolen mill to be established at Tientsin. The Westinghouse Electric & Manufactu ing Company received the order for the electrical, the Harrisburg Foundry & Machine Company that for the boiler and engine plant and the James Smith Woolen Machine Company, Philadelphia, will furnish the rest of the machinery.

CHICAGO MACHINERY MARKET.

Perhaps the largest transaction in engines here last week was the purchase of two vertical, cross compound, condensing engines by the Metropolitan Elevated Street Railroad Company, of Chicago. Each will drive a 1,650 kilowatt generator. The contract for these engines was taken by the E. P. Allis Company. It is expected that the engines will be in operation within a year. The Metropolitan Company is building a large addition to its power house on the West Side, where the new engines will be installed. There are a number of other large installations in power equipment under negotiation here, one of which is for the new Chicago Great Western shops at Oelwein, Ia. Municipalities are also very good buyers of power for various purposes. For manufacturing purposes the engine trade is moderately active, and the same, or a little better, can be said of boilers. The maker of boilers ordinarily views the market conditions with little show of pride. They fail to approximate his expectations or his wishes. But undoubtedly there is a vast amount of material going into this industry. The sellers of plates and of tubes are handling a much heavier tonnage than for the corresponding period last year. The remark has been made before, and may be repeated here, that it is the margins which are more satisfactory than the volume of business. Improvement in the former would prove a radical cure for present ills.

But the market for plates and tubes, however satisfactory it may be, does not quite fully represent the awakened activities in other branches of iron and steel. Prices in plates have not so thoroughly responded to the better conditions. Mill products are at least on the average $1 per ton higher than two weeks ago. The representative here of a large Eastern producer, who has been absent on a two weeks' vacation, reports more than that advance in values since he left the city. There seems no end to the demand for freight cars. One Western system has within a few days placed three orders, aggregating 3,250 cars. It is only a sample of what the carriers generally are doing. A car famine exists, and it is doubtless leading to renewed buying of equipment. The general industrial conditions of the West may be summed up in the one word—active. Where demand equals or exceeds the generous capacities for production there is betterment in values. Where the capacity leads there is steadiness of quotation. But almost everywhere there is life.

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Quotations.

NEW YORK, Monday, September 26.

Iron—American pig, tidewater delivery:

No. 1 foundry, Northern	$11 25 @ 11 50
No. 2 foundry, Northern	10 75 @ 11 00
No. 2 plain, Northern	10 50 @ 10 75
Gray forge, Northern	10 00 @ 10 25
No. 1 foundry, Southern	11 00 @ 11 25
No. 2 foundry, Southern	10 75 @ 11 00
No. 3 foundry, Southern	10 50 @ 10 75
No. 1 soft, Southern	11 00 @ 11 25
No. 2 soft, Southern	10 75 @ 11 00
Foundry forge, Southern	10 00 @ 10 25

Bar Iron—Base—Mill price, in carloads, on dock: Common, 1.05 @ 1.10c.; refined, 1.15 @ 1.20c. Store prices: Common, 1.30 @ 1.35c.; refined, 1.35 @ 1.50c.

Tool Steel—Base Sizes—Standard quality, 6 @

(Quotations continued on page 30.)

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Business Specials.

Gear wheels, gear cutting. Grant; see page 18.

Forming Lathes. Mer. Mach. Tool Co., Meriden, Conn.

Send for my water tube boiler catalog. E. P. Watson, Elizabeth, N. J.

Selden Packing for stuffing box, with or without rubber core. Randolph Brandt, 38 Cortlandt st., N. Y.

For Sale or Rent—Foundry and machine shop with additional land, in good condition and well equipped for medium heavy work; capacity of foundry 7 tons per day; located on railroad within eight miles of New York; terms easy. Call or address J. F. Sweasy, 26 Nassau street, New York.

Wants.

Situations and Help Advertisements only inserted under this head. Rate 50 cents a line for each insertion. About seven words make a line. The cash and copy should be sent to reach us not later than Saturday morning for the ensuing week's issue. Answers addressed to our care will be forwarded. Applicants may specify names to which their replies are not to be forwarded; but replies will not be returned. If not forwarded they will be destroyed without notice. Original letters of recommendation or other papers of value should not be inclosed to unknown correspondents.

Situations Wanted.

Dies—Tool-maker for jewelry and novelties with inventive ability. Box 261, AMERICAN MACHINIST.

Technical graduate, competent and reliable draftsman, wishes situation; 10 yrs. shop and drawing room exp. on engines, tools, jeweling, automatic and special mach.; good refs. Box 268, AM. MACH.

Pattern-maker wants steady situation. A. Maag, 330 Berry street, Brooklyn, N. Y.

Experienced machine designer having shop training; graduate. Box 271, AMERICAN MACHINIST.

Graduate mech. engineer, 28 years old, up in modern machine shop practice. Box 272, AM. MACH.

Foreman, pattern and draftsman; a good, steady, reliable man; good ref. Box 202, AMERICAN MACHINIST.

Mechanical draftsman desires position in New York; 17 yrs.' shop and office experience. Box 263, AM. MACH.

Situation wanted by a designer and inventor with a fine rec'd; perman't pos'n desired. Box 260, AM. MACH.

Exp. mech. draftsman, electrical work, hoisting or general mach.; A1 references. Box 248, AM. MACHINIST.

Foreman pattern-maker, competent draftsman, 15 years in charge. Scott, 65 Monmouth st., Newark, N. J.

A position wanted as machine shop superintendent by an up-to-date hustler; good references when desired. Address Box 262, AMERICAN MACHINIST.

An up-to-date mechanical superintendent will be open to an engagement shortly; a good manager of shop and men, and with a good reputation. Box 265, AMERICAN MACHINIST.

Wanted—Position operating cold forging rivet and bolt headers; 10 years' exp.; also 3 years' exp. operating bolt cutting machinery; can make tools and do repair work. Box 267, AMERICAN MACHINIST.

Superintendent or manager is open for position; practical mechanical engineer with office and business exp.; can handle office or shop or solicit trade; good character; ref. Address Box 234, AM MACHINIST.

A manager who has had long experience in general manufacturing and construction desires a position of responsibility; competent to direct, but will fill any position in works or office. Ad. Box 264, AM. MACH.

An experienced mechanical engineer and expert machinist having office in New York City desires to represent an engineering firm for the sale of their products in Eastern States; has connection in foreign country. Address Box 269, AMERICAN MACHINIST.

Mechanical engineer of ability, thoroughly familiar with hydraulic engineering and water wheels, and with experience in steam engines and general machinery, is open for responsible position. Address Technical Graduate, AMERICAN MACHINIST.

Mechanical engineer now located in New York State, accustomed to handling correspondence, desires position in charge of city office, or would accept position as first assistant with good concern; excellent references. Address Box 233, AMERICAN MACHINIST.

Help Wanted.

Wanted—Foreman for high speed engine shop; state experience, age and pay expected. Box 257, AMERICAN MACHINIST.

Wanted—A good man as assistant layer-out in large boiler shop; give reference and wages wanted. Struthers, Wells & Co., Warren, Pa.

Wanted a mach. shop foreman who understands thor. econ'cal produc. of center crank engs. in quan.; desirable location; state wages. Box 258, AM. MACH.

Wanted at once a first-class traveling man for an Ohio supply house to travel in Ohio and Indiana. Address Supply, care AMERICAN MACHINIST, New York City.

Wanted—First-class foreman for machine shop 20 miles from New York; must be familiar with heavy work and thoroughly competent to manage 50 machinists. Address Evaporator, care AM. MACHINIST.

Wanted—Foreman for engine works; state experience, age, reasons for desiring a change, and salary expected; this is a good chance for the right man to become a superintendent. Address 249, AM. MACHINIST.

Wanted—A superintendent for old established machine tool factory in New England; man competent to produce best work at least cost; give references, experience, terms, etc. Box 242, AMERICAN MACHINIST.

Wanted—An experienced mechanic competent to handle an important agency for machine tools in a large city; must have the highest testimonials and exp. as office man; all communications will be treated as strictly confidential. Address Box 241, AM. MACH.

Wanted for works in England first-class draftsman as designer of small tools, jigs, cutters, etc., for use on hand and automatic screw machines, milling machines, etc.; good job for capable man. Reply, giving full particulars of experience, age, salary, etc., to Box 243, AMERICAN MACHINIST.

Wanted—Two or three good machinists, those having had good experience on lathe preferred; also one first class blacksmith for general machine work, both heavy and light, and must have experience with steam hammer. Address, stating age, experience and character, Box 238, AMERICAN MACHINIST.

Wanted for England, a first-class machine tool draftsman as designer; accustomed to high-class milling machines, hand and automatic screw machines, &c.; good berth for a capable man. Reply, giving full particulars of age, experience and salary required, in confidence, to Box 221, AM. MACHINIST.

Wanted—As foreman of tool and mach. shop, a person having large exp. in designing and making special tools for light metal working; exp. in the handling of men and in shop manag'm't; pos'n perman't and compensat'n liberal to a person poss-es'g the right qualifications. Ad. in own handwriting, stating age, exp., refs. and sal. exp., E. W. R., 9 Murray street, New York.

Miscellaneous Wants.

Advertisements will be inserted under this head at 30 cents per line, each insertion. Copy should be sent to reach us not later than Saturday morning for the ensuing week's issue. Answers addressed to our care will be forwarded.

Philadelphia Book Co., Phila., Pa., catalog free.

Caliper catalog free. E. G. Smith, Columbia, Pa.

Dies and press tools. J. L. Lucas, Providence, R. I.

Book, Dies & Die Making, $1. J. L. Lucas, Prov., R. I.

Kit pattern or cabinet maker's tools, $30; cost $70. Box 270, AMERICAN MACHINIST.

The Dutton Wet Twist Drill-Grinder is sold by the Garvin Machine Co., New York City.

Light and fine mach'y to order; models and electrical work specialty. E. O. Chase, Newark, N. J.

Cone pulleys; can you design cone pulleys? Send for pamphlet; new method; simple rules for all cases. 50 cents. W. K. Palmer, Lawrence, Kan.

To buy working drawings and patterns, either or both, for an up-to-date lathe in sizes 14 in. by 6 ft. and 18 in. by 8 ft. Ad. Alexander, care AM. MACHINIST.

Gasoline Engines, all sizes, 1 to 60 H. P.; send for circulars, terms and prices; castings fur. to build your own engs. Dirigo Eng. & Mach. Works, Portland, Me.

Wanted—A 28 or 30 inch lathe, 12 foot bed; 42 inches by 12 feet planer, two heads; must be modern tools; give full description and price f. o. b. cars. Box 266, AMERICAN MACHINIST.

Wanted—Machines for manufacture of turned and ground steel shafting; price and time of delivery to be sent to X. Y. Z., care of T. B. Browne's Advertising Offices, 163 Queen Victoria street, London, England.

The advertising department of the American Machinist has on hand 20,000 draftsm'n's thumb tacks; will send a box of ten to any draftsman in America on request; could use a postage stamp on box, but will send the tacks anyway.

Institutions retiring from business having machine tools, brass or wood working machinery, will find it to their interest to correspond with us. We purchase complete plants or handle them on com. C. C. Wormer Mach Co., 55-59 Woodbridge st., W., Detroit, Mich.

For Sale—On account of death, 15 horse-power engine, 20 horse-power boiler, in good condition; 20 feet of 2-inch line shaft, pulleys, hangers; one granite polishing machine; one drill machine for iron, very cheap. A. Durkes, 652 Lewis street, Union Hill, N. J.

OIL FILTERS

THE BURT MFG. CO., Akron, O., U. S. A.

RUSSIA.

Wossidlo & Co.,

MERCHANTS AND ENGINEERS,

St. Petersburg and Moscow.

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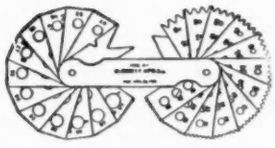

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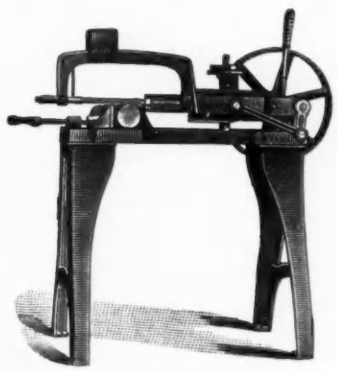

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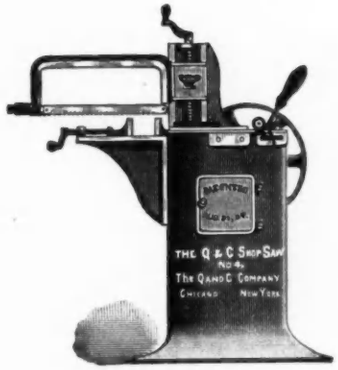

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(Quotations continued from page 38.)

7c., with lower prices on some brands; extra grades, 11 @ 12c.; special grades, 16c. and upward.

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Lard Oil—Prime city, ice pressed, 43 @ 45c., in wholesale lots.

▲ ▲ ▲

Manufacturers.

The Vulcan Iron Works, at Seattle, Wash., are being enlarged.

William C. Brown, Deering, N. H., is building an addition to his box factory.

Cole, Senior & Co., Milford, Mass., are building an addition to their dye house.

An addition is being erected to the Beitzel planing mill, on the Plank road, York, Pa.

The Dwight Manufacturing Company, of Boston, Mass., will erect at Gadsden, Ala., a new cotton mill.

The Reading, Pa., Cycle Manufacturing Company will erect a two-story addition, 20x40 feet, to its plant.

At East Templeton, Mass., the Bay State Metal Wheel Company contemplates the erection of a new factory.

Messrs Byrn & Campbell, Brownsville, Tenn., have leased the Kelly lot for the erection of a spoke factory.

Additions are being built to R. S. Newbold & Sons Company's foundry and machine shops at Norristown, Pa.

The Maryland Steel Company, Sparrows Point, Md., is making preparations to put its shipyard in operation again.

A new firm is that of Freeman & Duckworth, Lawrence, Mass., practical machinists, who have just opened a shop.

Otto Nelson has been awarded the contract for rebuilding the factory of the Bangor (Me.) Electric Clock Company.

Ground was broken recently for the new power house for the electric railway at Noble Island, Me. Cost, $17,000.

The Hampton Manufacturing Company, of Bay City, Mich., will rebuild its factory, which was recently destroyed by fire.

A malleable iron foundry is being added to the plant of the Missouri Car and Foundry Company, at St. Louis, Mo.

W. R. Jones & Son, of the Jones Window Glass Factory, at Eaton, Ind., are preparing to build a window glass factory.

The Toronto (Ont.) Carpet Company is to erect a new factory in that city. The dimensions of the new place will be 325x158 feet.

J. O. Isanogie, Boston, Mass., has received the contract for the erection of the Eicholtz Flouring Mills, recently burned at Lewiston.

The American Turret & Lathe Works have been organized at Cincinnati, Ohio, to engage in the manufacture of turret lathes and other machine tools.

Architect Julius Hess is preparing plans for a new factory for the Buhl Stamping Company, Detroit, Mich., whose building was recently destroyed by fire.

The certificate of incorporation of the Economic Sewing Machine Company, Newark, N. J., was recorded recently. The company will manufacture sewing machines and other machinery. Its authorized capital is $50,000. The incorporators are Thomas W. Bracher, Edward E. Pol-

lack, George B. Raymond and Howard K. Wood.

C. F. Springer, representing the United States Steel Casting Company, recently visited Marion, Ind., for the purpose of locating a steel plant to cost $100,000.

G. Elias & Brother, Buffalo, N. Y., recently filed plans with the Bureau of Building for a two-story brick planing mill to be built at 965-971 Elk street.

The Middlesborough Foundry & Machine Company has been organized to succeed the Crows Foundry & Machine Works, at Middlesborough, Ky.

The Oklahoma Agricultural & Mechanical College, Stillwater, Okla. Ter., will shortly be in the market for equipment of the woodworking and machine shop.

The Hampden (Mass.) Glazed Paper Company will build an addition to its mill to cost several thousand dollars. The building will be raised from one to three stories.

Contractor Philip Haibach, Philadelphia, took out a permit recently for the four-story manufacturing building, 42x63 feet, to be built at 207, 209 and 211 Butonwood street, Philadelphia, for George F. Ott.

The C. H. Haeseler Company, makers of pneumatic tools, have removed from their old shops to quarters double the size at Twelfth and Hamilton streets, Philadelphia. They are putting in new tools.

The Indianapolis (Ind.) Cold Storage Company intends to erect a new building to cost $300,000. The officers of the company are Wm. D. Owen, president; W. E. Stevenson, treasurer, and W. T. Noble, secretary.

The American Automobile Company, with a capital stock of $500,000, filed articles of incorporation recently. The chief office of the company will be in Plainfield, N. J. It will engage in the manufacture of motors and other electrical appliances.

Mr. J. A. Record, of Livermore Falls, Me., whose iron foundry was destroyed by the big fire, has secured a lot of Mrs. H. Richardson on upper Main street and will begin at once the erection of a larger and better foundry than the one destroyed.

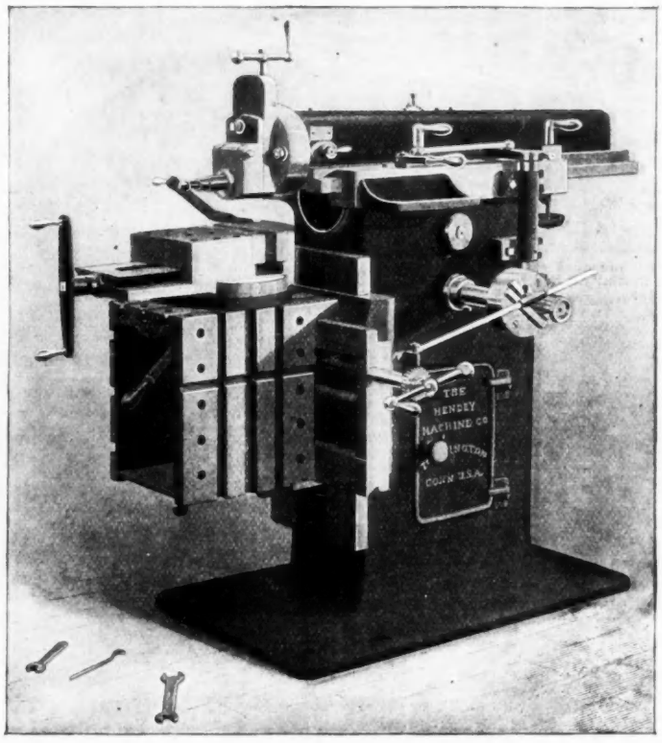
Architect Richard E. Raseman is preparing plans for a two-story brick factory and machine shop for Reese & Reckmeyer, to be built on the north side of Harper avenue, Detroit, Mich. It will be 92x162 feet in size, of mill construction, and will cost $10,000.

Nearly $60,000 worth of property was destroyed by fire recently. The plant of the Hunt Manufacturing Company, Walla Walla, Wash., together with Roberts' foundry, two dwellings and a warehouse, were completely destroyed. The Hunt Company will rebuild at once with an increased capacity.

Bridgton, Me., has a fair prospect of having a new manufacturing industry, run by H. F. Ford, of Yonkers, N. Y., a skilled carpet manufacturer. It is proposed to run fifty looms. The power will be furnished by the Electric Company, though a new building and machinery is involved.

The Tennessee Spoke Company, formerly located at Union City, Tenn., recently completed the deal for the property of the old Decatur (Ala.) Charcoal & Chemical Works, comprising fourteen acres of land and some fine brick buildings on the bank of the Tennessee River, in New Decatur. A spoke factory and sawmill will be erected at once.

A steel mill for the manufacture of hoops, cotton ties and bands will be erected this fall at Monessen, Pa., by the Monessen Steel Company, at a cost of $400,000. The company is backed financially by some of the leading capitalists of Pittsburg, among the prominent stockholders being Col. J. M. Schoonmaker, vice president and general manager of the Pittsburg & Lake Erie Railroad; H. Sellers McKee, the glass manufacturer, and Veryl Preston, formerly prominently connected with the Buhl Steel Com-



24 inch Pillar Shaper.

These shapers have a positive locking friction, and are guaranteed to work accurately to a line.

Stroke quickly adjusted to any position with ram in motion. Then it can be varied in the smallest degree with our micrometer adjustment stop. Shapers have quick return, also two cutting speeds.

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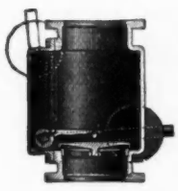

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This valve has no dash pots, springs, guides or complicated levers to get out of order. It is simple, reliable and well made. Never sticks, and can be relied upon at all times when using exhaust steam for heating; or when used as a relief, or free exhaust on a condensing plant, it has no equal. It is noiseless and free from any complicated attachments.

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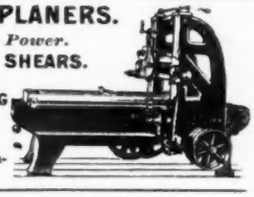

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For Advertisement of
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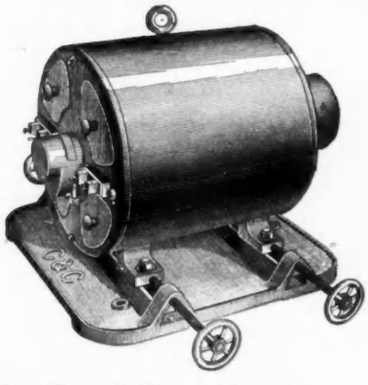
Advice to Inventors and Manufacturers.

A modern equipped machine factory in Vienna wishes to enter into correspondence with parties, with a view to completing patented improvements on machinery, and eventually undertaking sale of same in Austria-Hungary, etc. Terms guaranteed. Address A. H., 45, Wien v-1, Austria.



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Complete Electric Power Transmission Systems.

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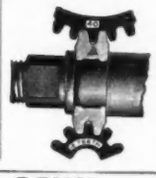

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Pat. Duplex Gear Cutter.

One pair of these cutters cuts every size gear from 12 teeth to a rack of same pitch. For jobbing and small machine shops are indispensable. Send for prices

R. M. Clough, Tolland, Conn.

pany, of Sharon, and the Apollo Iron & Steel Company, of Vandergrift.

Avonmore, Pa., has secured a tin plate mill. It is to be a six-mill plant, and will employ upward of 300 men. Work on the buildings is to begin soon. This new company, it is said, will absorb the Alcania Terne & Tin Plate Company, of Youngstown, Ohio. The board of directors of the new company are M. M. Garland, W. H. R. Hilliard, Oliver Wylie, W. S. Collier and T. H. Jeremiah.

Lathbury & Spackman, Philadelphia, Pa., consulting engineers, 1619 Filbert street, are receiving bids for the erection of a group of buildings for the Lawrence Cement Company, at Siegfried, Pa. They comprise a kiln building, 120 by 126 feet; a mill building, 65 by 285 feet; an engine building, 75 by 105 feet; a boiler house, 42 by 102 feet; a stock house, 120 by 462 feet, and a fuel burning house, 30 by 60 feet.

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New Catalogs.

There are three sizes of Standard Catalogs, first authorized by the Master Car Builders' Association, 9" x 12", 6" x 9" and 3½" x 6". We recommend the 6" x 9 size for machinery catalogs. When they must be larger or smaller, one of the other standard sizes should be adopted if possible.

From the Guinn Ball Bearing Company, Baltimore, Md., we have received catalog in which is shown the application of ball bearings to swivels, pulley blocks, &c. The catalog is 5x6½ inches.

Landis Tool Company, Waynesboro, Pa., sends us catalog of universal and plain grinding machines, gear cutter grinding attachments, knife grinding attachments, etc. The catalog is standard size, 6x9 inches.

J. J. McCabe, New York, has issued a catalog illustrating and describing a double spindle triple geared lathe. This lathe is practically a combination of two lathes in one, and is intended to take the place of gap lathes. Front and rear views of the machine are given. The catalog is 6x9¼ inches.

Olney & Warrin, New York city, have sent us catalog of the Olin Gas engine, for which they are the agents. For small printing offices, residential electric lighting plants, &c., these engines can readily be adapted. They are made in sizes ranging from 2½ to 35 horse power. The catalog is 5½x7 inches.

From the Warren Steam Pump Company, Warren, Mass., we have received catalog No. 1, in which are described a variety of pumps for different services. The catalog contains a number of useful tables for those interested in the installation and running of pumping machinery. The catalog is 5½x7¾ inches.

We have received 1898 catalog of lathes and other machine tools from F. E. Reed Company, Worcester, Mass. The various styles of lathes are minutely described. In addition to accounts of complete machines various attachments for lathes, scraper's benches, countershafts, etc., are described. The catalog contains a cipher code, and is standard size, 6x9 inches.

We have received from the Hartford Rubber Works Company, Hartford, Conn., a tastefully gotten up catalog, entitled "From Forest to Factory," in which are described the various processes through which the rubber is put prior to being placed on the market in the shape of bicycle tires. By means of illustrations the gathering of the rubber by natives is shown, views of Para, South America, and Hartford, Conn., are given, and also a number of illustrations of the company's plant, showing grinding, calendering and pressing machines. The catalog is 6½x9 inches, and should prove of real

We Make **Boring Machines, Milling Machines, Special Tools** BEAMAN & SMITH, PROVIDENCE, R. I.

interest to those interested in the manufacture and sale of rubber.

We have received from the Sims-Dudley Defense Company, New York city, catalog illustrating and describing their powder pneumatic gun, an account of which was published in our issue of July 28. Accompanying the catalog is a number of press comments on the work performed by the guns during the recent fighting in Cuba. The catalog is 3¼x6 inches.

The Builders Iron Foundry, Providence, R. I., has sent us 1898 catalog of grinding and polishing machinery. The different machines described are numerous, and the catalog is profusely illustrated. In addition to the purely descriptive matter some rules for finding speeds of emery wheels and also a cable code are included. The catalog is standard size, 3½x6 inches.

The Windsor Machine Company, Windsor, Vt., has forwarded to us copy of catalog in which are illustrated and described various styles of turret machines for making duplicate parts from forgings and castings. Illustrations of screw machines and lathes are presented and full detailed description of each part, together with dimensions, are given. The catalog is standard size, 6x9 inches.

We have received from the Chicago Pneumatic Tool Company, Chicago, Ill., two special edition catalogs, one being devoted to the description and illustration of pneumatic riveters, hammers and drills, and the other to wood boring machines, breast drills, car jacks and pneumatic painting machines. Both catalogs contain illustrations showing the various devices in use. They are standard size, 6x9 inches.

We have received from Henry Blundell & Co., of Providence, R. I., copy of catalog containing illustrations and descriptions of sensitive drills for use in the manufacture of typewriters, bicycles and articles requiring small holes in light work. In addition to the catalog we have received from the same firm circulars relating to screw presses, rolling mills, buffing lathes, also tools used by jewelers and silversmiths.

The Nottingham Engineering Company, Limited, Radford, Nottingham, England, sends us a catalog of shafting, bearings, couplings and other fittings used by those who are interested in the transmission of power, such as link belting, pulleys, plummer blocks, wall brackets, etc. The catalog contains several tables likely to be useful in the erecting of line shafting. A cipher code is included, and the catalog is 5¾x9 inches.

We have received from the Consolidated Safety Valve Company, New York, copy of catalog in which are described and illustrated single, duplex and triplex pop safety valves, a number of which are made specially to meet the demands of marine service. Interior and exterior views of the factory are shown and a number of testimonial letters are also included. The catalog is standard size, 6x9 inches, and will be mailed to those interested on application.

The Gardner Governor Company, Quincy, Ill., has issued a new catalog illustrating and describing pumps and pump governors, balanced lever valves, steam engine governors, etc. These pumps are constructed to meet the requirements of different services. Boiler feeding, fire pumps, water works pumps, etc., are shown both simple and compound acting. The catalog contains some useful information on the erection and management of pumps and is 5¼x7¾ inches.

We have received from Watson-Stillman Company, New York, copy of catalog No. 50, which is devoted to the illustration and description of hydraulic tools suitable for use in railroad work. These tools include hydraulic jacks of various styles, pit jacks for engine trucks, portable hydraulic punches, wheel and crank pin pressers, etc. The detail descriptions of the above named tools are very full, and those interested in railroad work will find much in the catalog to interest them. It is standard size, 6x9 inches.

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The student first studies the Instruction Paper carefully, then draws Plate 1, and mails it to us in the mailing tube. He then begins on Plate 2, and works on it until he hears from us regarding Plate 1.

When Plate 1 is received at the Schools the Instructor in Drawing examines it carefully and notes upon it in pencil the points in which it can be improved, and his suggestions for the guidance of the student. If necessary, he writes a detailed letter covering everything thoroughly, so that the student may have the full benefit of his knowledge and experience, the same as if he were a teacher in a regular school. He assigns a percentage mark to the student's work, and requires him to redraw it if 90 per cent. or over is not attained. The corrected work, with the suggestions, is then returned to the student in a mailing tube.

When the student receives a passing mark on Plate 1, he sends us Plate 2, on which he has been working while Plate 1 was in our hands, and begins work on Plate 3. The same process is gone through, with from fifteen to forty plates, and two or more tracings, depending upon the Course. The second Instruction Paper is sent with the proper Plate, explaining the advanced principles, giving directions in regard to the remaining plates and containing full instructions for tracing, preparing blueprint paper, and taking blue prints. We reserve the privilege of retaining, if we so desire, several of the plates made by each student to use as an exhibit of progress made under our instruction.

We have achieved signal success in teaching Drawing. We can teach any man to draw well. The average student will learn under our instruction to make a neat and well lettered drawing, and with practice will become an expert draftsman. Our correspondence is constantly informing us of tangible results from our Drawing Courses. Laborers, clerks and machinists have taken positions in drafting rooms. Many others write to tell us of substantial improvements in their positions and salaries. A college student was allowed 95 per cent. on a two years' course in drawing at his college on account of the excellence of the work done with us. The results of our instruction were at first beyond even our own expectations, but the almost daily additional evidence we are receiving in the shape of superior drawings made by our students enables us to say with confidence, not only that students can learn to draw well under our instructions, but that there is no better method than our own for teaching this important subject.

We also teach by mail Mechanical, Electrical, Steam or Civil Engineering; Mathematics, Chemistry, Mining, Telephony, Architectural Drawing, Surveying, Plumbing, Architecture, Bookkeeping, Shorthand; English branches.

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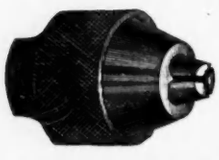

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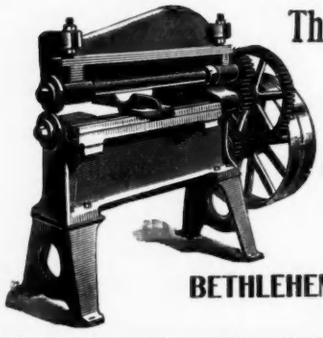

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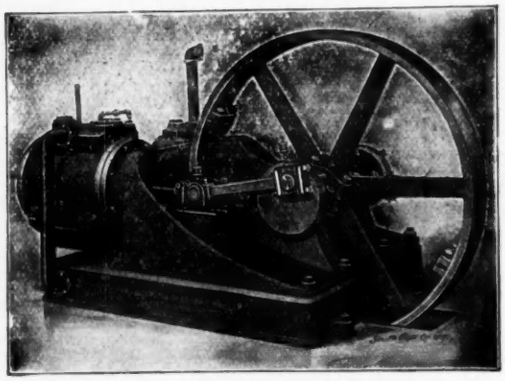

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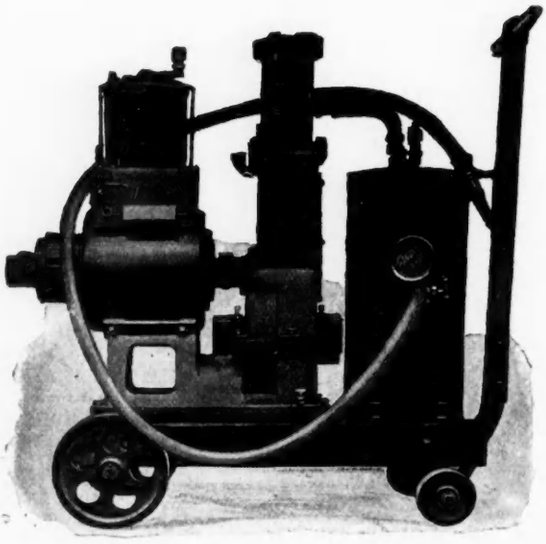

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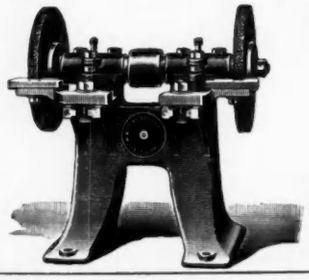

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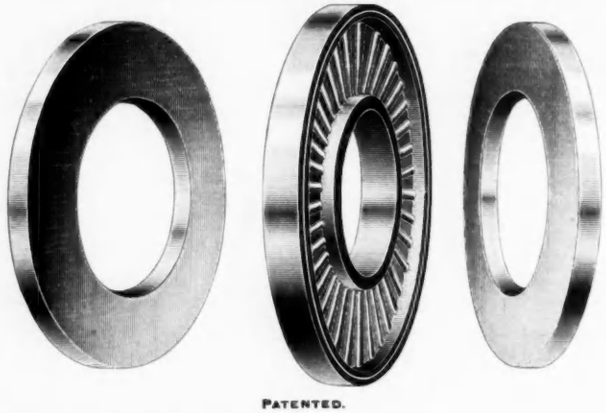

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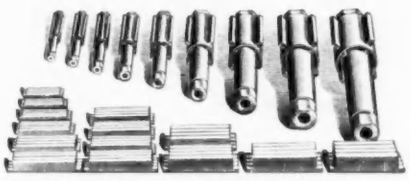

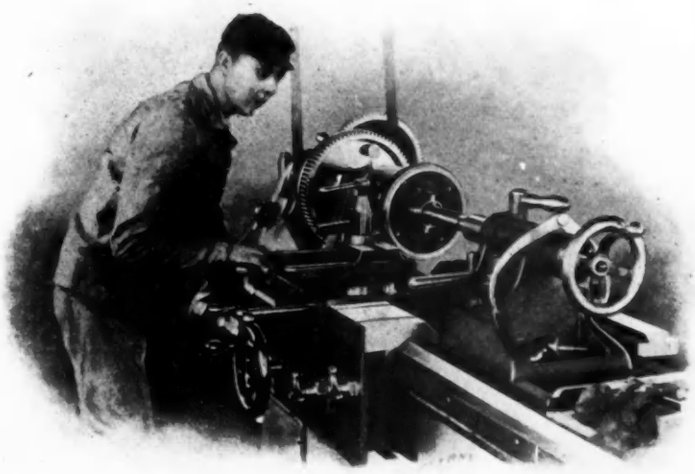

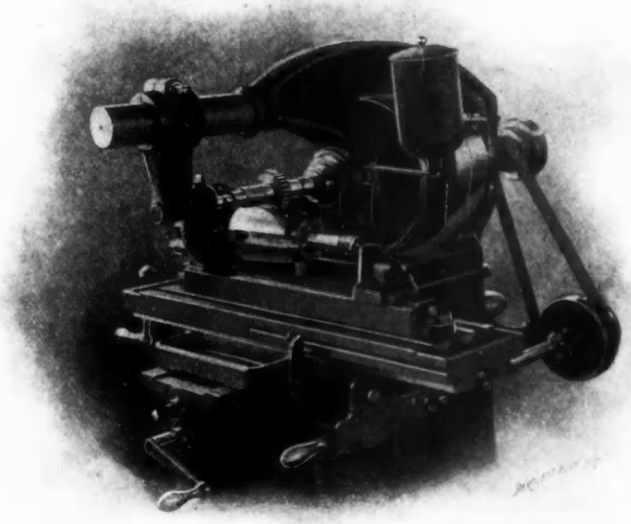

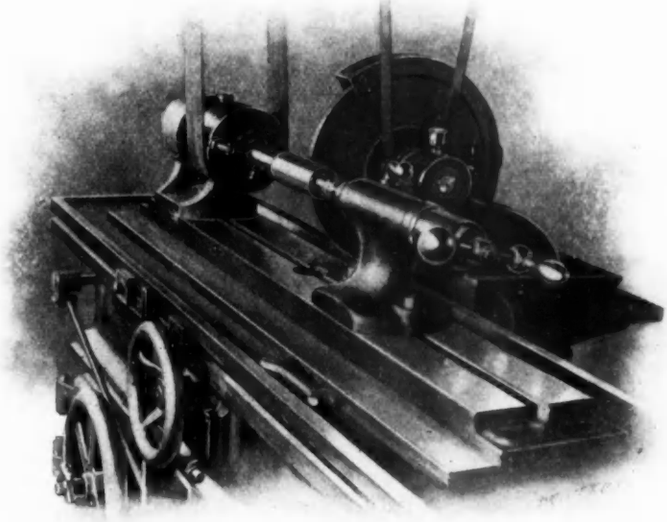

will hold work for lathe, milling machine, grinder or any other tool firmly and accurately. No hunting over an old pile of solid mandrels for the right size. No truing up. These mandrels are true — ground after hardening. Our set of nine will fit every hole from 1 to 7 inches in diameter. Special attention is paid to the centers in the arbors to insure best results. They are well protected from possible injury by driving because of the special shape of the ends of the arbors, which are nicely rounded from the center to the outer diameter. A set of these mandrels will last many years, save time, hold better and permit truer work than any other kind. Hundreds in the best shops of every kind in America and Europe. They say they cannot afford to do without them. Send for our new "Mandrel Book," free. Then you will say the same.

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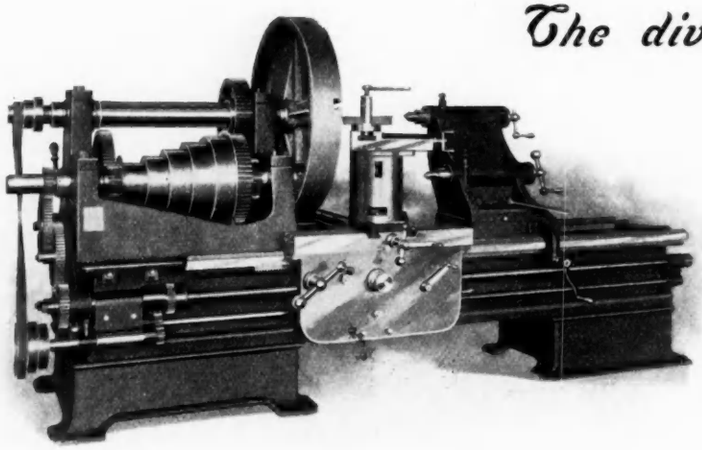

This is actually two lathes in one, combining a 26-inch for the common range of work, and a powerfully triple-geared 44-inch swing for the heaviest classes of work. Swings 39 inches over the carriage, equal to a regular style 54-inch swing. Has wide screw-cutting range from 12 threads to the inch to 3 inch P. Has internal geared face plate geared 66 to 1 for heavy work.

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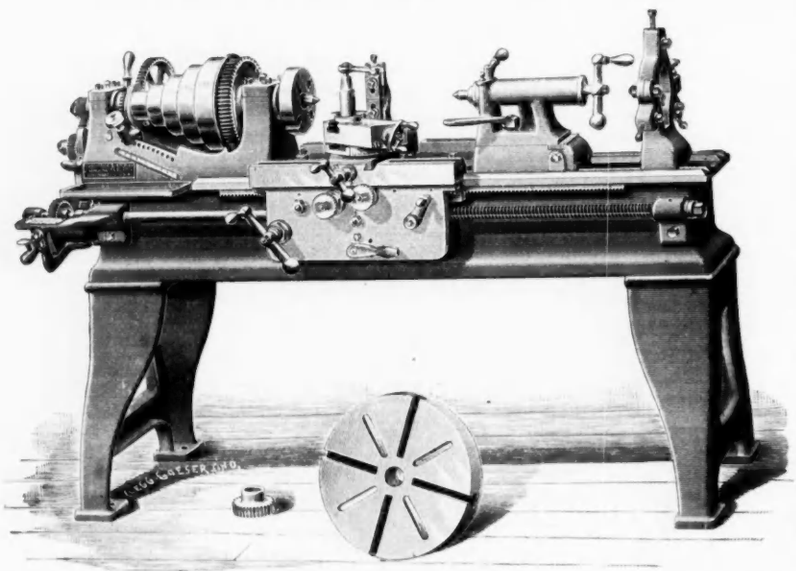

are familiar to the American mechanic, to meet whose increasingly exacting requirements our line of improved Engine Lathes is offered.

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Cuts entire index of threads and feeds without altering a gear or belt. Produces a large percentage more of work than the old type.

Sizes 14 in. to 42 in. Swing.
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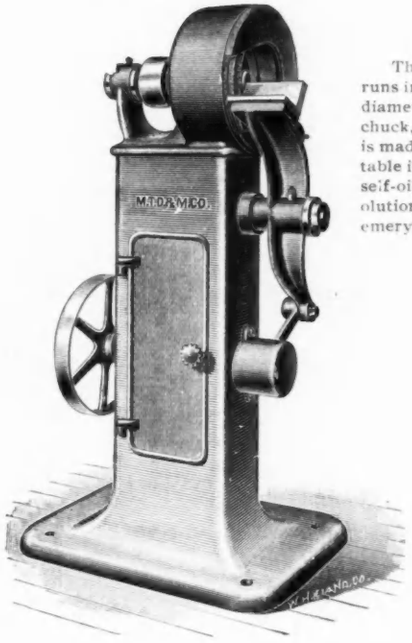
No. 134.

Face Grinding Machine.



Morse Twist Drill and Machine Co.,

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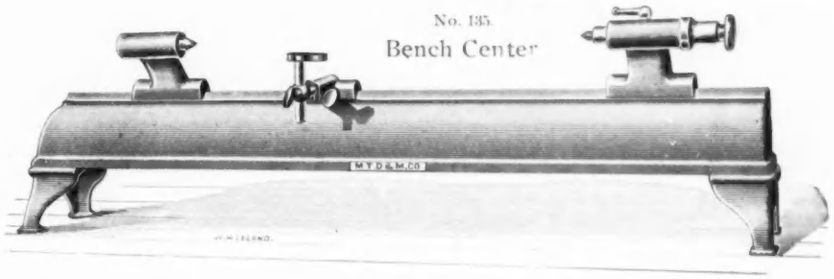
This machine is for use for facing the ends of work either hardened or soft. The spindle is of steel, and runs in bronze boxes, which are provided for compensation for wear. An emery cylinder wheel, 8 inches diameter, with 1¼ inch thickness of rim, is secured to the spindle and held firmly by means of a cylinder chuck, the chuck having a threaded disk operated by a spanner to force out the wheel as worn. Provision is made for connecting the machine with an exhaust fan for withdrawing the dust. The travel of the work table is automatic, and can be adjusted for work of any size to 3 inches diameter. The countershaft has self-oiling hangers; tight and loose pulleys, 6 inch diameter, for 2½ inch belt, and should run about 580 revolutions per minute. Net weight about 500 pounds. Floor space 18 inches by 24 inches. Price includes one emery cylinder wheel wrenches and overhead work. Price on application.

"Believe me when I tell you that thrift of time will repay you in after life with a usury of profit beyond your most sanguine dreams, and that the waste of it will make you dwindle, alike in intellectual and in moral stature, beyond your darkest reckonings."—*Gladstone.*

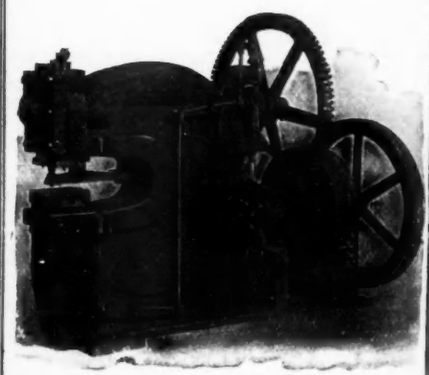
No. 135.

Bench Center



The Bench Center will swing 6 inches diameter and take 36 inches in length between centers. The head and foot stocks can be adjusted to any position, and secured by a clamp. The spindle is of steel, ¾ inch diameter, and has a taper hole which admits of using centers as required, and is adjusted to work by a coiled spring, which admits of considerable variation in the length of the piece to be centered. The rest can be adjusted to any position and securely fastened by a clamp, and supplies a support for the hand or for attaching an indicator for testing work held on center. Net weight about 50 pounds. Price includes male and female centers. Price on application.

The Bullock Electric Mfg. Co.



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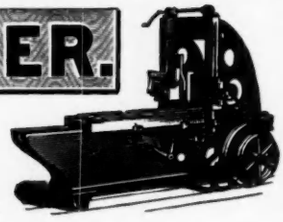

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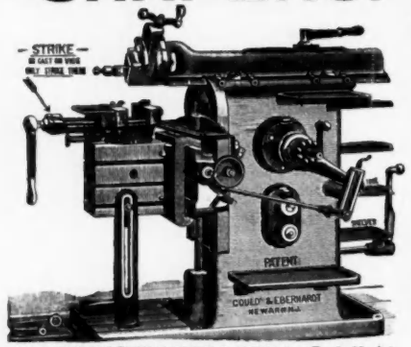

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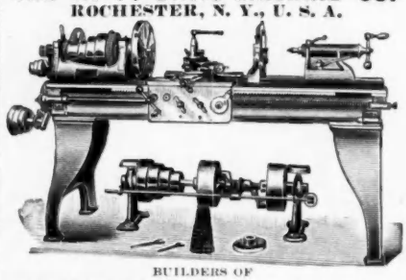

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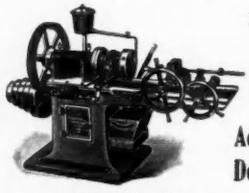

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